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**JISC DEVELOPMENT PROGRAMMES****Project Document Cover Sheet****CD-LOR Deliverable 1:****Report on Learning Communities and Repositories****Project**

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# Community Dimensions of Learning Object Repositories



## ***Deliverable 1*** **Report on Learning Communities and Repositories**

Final public version, 5<sup>th</sup> April 2006

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## Executive Summary

**Introduction:** The Community Dimensions of Learning Object Repositories (CD-LOR) project was funded by the JISC from June 2005 until May 2007 to identify and analyse the factors that influence practical uptake and implementation of learning object repositories (LORs) within a range of different learning communities. This document is the Executive Summary of the first CD-LOR deliverable, a report detailing the findings of initial desk research and stakeholder consultation carried out by the project up to the end of January 2006. The report is the foundation upon which the remaining deliverables will be built, and was intended to give an initial mapping of types of learning communities to barriers and enablers to uptake and embedding of LORs. However, the notion of “types of learning communities” changed somewhat in the early stages of the project, when it became clear that dimensions of learning communities may be more useful (as noted below). While the report will not be updated, CD-LOR will collate feedback, comments and discussion from the wider educational community throughout the life of the project, in order to inform the remaining deliverables.

**Defining our terms:** CD-LOR's partners have their own definitions of what constitutes a useful chunk of teaching and learning material. The project is exploring the usefulness of repositories of such materials in support of learning communities. ‘LOR’ is intended as useful shorthand for organised collections of digital teaching and learning materials.

**Why CD-LOR?:** There has been much discussion about the barriers to implementation and use of LORs, but this has not been tailored to the needs of specific types of learning communities. Moreover, pedagogical, social, and organisational factors have not been at the forefront in LOR development to date, and implementation is still relatively immature. CD-LOR aims to investigate these issues in order to develop guidelines tailored for a range of different learning communities.

**Using LORs to support teaching and learning: barriers & solutions:** Barriers to the use of LORs in education may be grouped into four main areas: socio-cultural; pedagogic; organisational management (including information management); and technological. Possible solutions that have been suggested in the literature may also be grouped under these areas:

### Solutions to socio-cultural issues

- Design of the LORs should be based on understanding of cultural norms and expectations of the user communities (a particular focus of CD-LOR).

### *Solutions to pedagogic issues*

- Emphasis on pedagogy pull vs. technology push.
- Development of LORs by multidisciplinary teams (including teaching practitioners as well as learning technologists and librarians).
- Provision of examples of successful use of LORs related specifically to teaching and learning.
- Development of LOR models involving co-construction of resources by the students.
- Demonstration of impact for learning and added value for individual users.
- User development and support in information literacy.

### Solutions to organisational and information management issues

- Incentives and rewards linked to community needs and goals.
- LORs linked to organisational strategy and objectives.

### Solutions to technological issues

- Facilitating ease of use, engagement, efficiency and pedagogic effectiveness.
- Conceptualisation of LORs as a context rather than isolated tools.
- Effective policies and practices for metadata creation

**Learning communities:** LORs are usually provided to support a teaching and learning community (broadly defined as a group of stakeholders), however, they may carry the implicit or explicit expectation that a particular community of users will coalesce around the LOR out of that broader community of stakeholders, and that engagement in this community will be beneficial to the teaching and learning needs of those involved. Therefore, while understanding the broader existing community is important, how the second level of community may be encouraged, supported and developed is of particular interest. One challenge for CD-LOR is that, while all the project partners have some understanding of their stakeholder community, few have achieved an active user community that may be investigated.

**Typology and dimensions of communities: building Structured Guidelines:** In mapping barriers and solutions to real learning communities, developing a discrete typology of learning communities is less useful than looking at specific dimensions of communities. Common key aspects of communities include: shared goal(s); shared interest or practice; and a shared repertoire of tools, processes, and concepts. Unpacking these further provides the beginning of an understanding of relevant dimensions of LOR communities. CD-LOR began by collating a list of useful dimensions of repository developments, including purpose (of the repository), disciplinarity, scope, contributors, and business model. Dimensions specifically related to communities include purpose (of the community), modes of communication, roles, coherence, context, rules, and pedagogic approach. CD-LOR's end goal is the development of a set of structured guidelines for those setting up or evaluating LORs, based around a series of questions that may be worked through, with the answers leading to specific advice, guidelines and resources. Therefore, a set of questions based around these initially identified dimensions has been sketched out. These questions will be further developed, with sub-questions drawing out specificities emerging throughout the life of CD-LOR, utilising the project partners and the wider LOR development community via the JISC DRP wiki. The following questions were identified as a useful starting point for this work:

1. What is the purpose of the LOR? (e.g., what kinds of learning resources will be stored in the repository and why?)
2. Who are the key stakeholders of the community? Of these, who will contribute and use resources in the LOR?
3. What business model will be used in the operation of this repository?
4. What is the purpose (shared goal) of the community or communities that the repository will help facilitate?
5. What are the modes of participation and communication in that community?
6. What are the roles and responsibilities of those involved in the community?
7. How coherent is the community?
8. What is the broader context within which the community operates?
  - a. What subject(s) or discipline(s) will the repository serve?
  - b. What is the scope of the stakeholder community the repository will serve? (e.g. departmental, institutional, national?; HE, FE, both?)
9. What are the implicit and explicit rules that govern the functioning of that community? (e.g. rules of conduct, rewards and incentives, control of access, workflows, etc.)
10. What pedagogical approaches are in use within the community?

**Next steps:** CD-LOR is now investigating personal resource management strategies of potential users, and institutional policy and strategy related to LORs, alongside development and evaluation of specific proposed solutions to barriers within real learning communities. All of this will feed into the structured guidelines. To this end, feedback on this report is welcome; please visit the project website for details: [http://www.jisc.ac.uk/index.cfm?name=project\\_cdlor](http://www.jisc.ac.uk/index.cfm?name=project_cdlor)

# 1. Introduction

This report comprises *Deliverable 1* of the Community Dimensions of Learning Object Repositories (CD-LOR) project<sup>1</sup>:

“1. *Report* (including literature review) on current LOR models and practices, with a mapping of types of learning communities to drivers, barriers and enablers to uptake and embedding [of LORs]”<sup>2</sup>.

It summarises the findings of initial desk research and stakeholder consultation carried out by the project.

CD-LOR was funded by the JISC<sup>3</sup> to “identify and analyse the factors that influence practical uptake and implementation of learning object repositories (LORs) within a range of different learning communities”<sup>4</sup>. As the first CD-LOR deliverable, this report is the foundation upon which the remaining deliverables, particularly *Deliverable 9: Structured Guidelines*, will be built. A full list of the remaining deliverables follows:

- “2. *Use cases* describing use of LO repositories within learning communities and mapping potential enablers and solutions to barriers, with prioritised use cases refined through testing of solutions.
3. *Software plug-ins and tools* (with *documentation*) and *Technical recommendations* for technical solutions developed based on use cases prioritised by learning communities.
4. *Evaluation reports* on tested technical and non-technical solutions.
5. *Case studies* presenting tested technical and non-technical solutions.
6. *Use cases* describing wider institutional incorporation of LO repositories within institutional knowledge and information management strategies and other relevant systems and workflows.
7. *Report* on institutional and personal knowledge management review.
8. Institutional strategy and policy *recommendations*.
9. *Structured guidelines* for those setting up or evaluating LO repositories, based around a set of questions designed to elicit the relevant drivers, barriers and enablers for the particular learning community type as identified in *Deliverable 1: Report*.
10. *Recommendations* to JISC for further research and development.”<sup>5</sup>

The first draft of this report was produced as the main output of CD-LOR Workpackage 2: LO Repositories and Learning Communities, for which the objective was to “identify current LO repository models and practices in relation to learning community types”<sup>6</sup>. Workpackage 2 involved a literature review, including relevant international educational and learning technology literature, as well as outputs from recent and current JISC-funded projects, and analysis of documentation produced by LOR development communities such as the CETIS SIGs<sup>7</sup>. This work was intended to identify current LOR models and practice, and to map a typology of communities to barriers and facilitators to embedding LORs.

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<sup>1</sup> <http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/>

<sup>2</sup> From CD-LOR Project Plan (p.6): [http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/CDLORProjectPlan\\_ProjectPlan\\_v1p0\\_Public.doc](http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/CDLORProjectPlan_ProjectPlan_v1p0_Public.doc)

<sup>3</sup> Joint Information Systems Committee: <http://www.jisc.ac.uk>

<sup>4</sup> From CD-LOR Project Plan (p.2)

<sup>5</sup> From CD-LOR Project Plan (p.6-7)

<sup>6</sup> From CD-LOR Project Plan (p.26)

<sup>7</sup> Centre for Educational Technology Interoperability Standards Special Interest Groups: <http://www.cetis.ac.uk>

Workpackage 3.1 then consolidated this desk research through consultation with the CD-LOR Associate and Collaborative Partners<sup>8</sup> via a workshop on October 20<sup>th</sup> 2005, with email discussion follow-up, and with the international CD-LOR Steering Group<sup>9</sup> via email communication and a combined face-to-face/teleconference meeting on February 6<sup>th</sup> 2006. Further work within Workpackage 3, namely LOR user interviews and a survey of learning materials developers<sup>10</sup>, alongside gathering, prioritisation, implementation and evaluation of Associate Partners' solution-focussed use cases, will continue the development and investigation of the ideas laid out within this report.

The research upon which this report is based was guided by the following questions:

1. What are the different types of learning communities that use, or may want to use LORs?
2. What are the key drivers, barriers and enablers to using LORs to support teaching and learning in such communities?
3. How do these barriers and enablers relate to the different types and dimensions of LORs and communities?

## **2. LORs in support of teaching and learning: The story so far**

This section reports on the findings of the CD-LOR literature review, giving an overview of current experience and relevant theory related to LORs and learning communities. It begins by defining how the terms 'learning objects' and 'learning object repositories' are used by CD-LOR, and why the project was proposed for funding (*Sections 2.1-2.2*). Secondly, it outlines the key barriers in implementation of LORs (*Section 2.3*), with an overview of solutions proposed in the literature given in *Section 2.4*. In *Section 2.5*, we move from repositories to looking at the communities that LORs (could potentially) serve. Theories relating to learning communities (including pedagogy) are briefly reviewed here, and key dimensions of communities and LORs are identified (*Section 2.6*). The following section (*Section 3*) reports on the subsequent consolidation and extension of these findings through the project's initial stakeholder consultation, with an initial mapping of barriers and proposed solutions to learning community dimensions.

### **2.1 Learning objects, learning object repositories?: Defining our terms**

LORs have emerged in recent years with the aim of facilitating sharing and reuse of learning resources or learning objects (LOs)<sup>11</sup>. Definitions currently in use for the term "learning object" mainly cluster around the idea of a highly granular digital resource developed to meet a single learning objective<sup>12</sup>. LOs may be aggregated to form larger units, and may be incorporated into a range of learning activities, be they entirely online, within blended learning, or classroom-based. Key to the idea of LOs is that they should be durable, interoperable, reusable and shareable. Although they are developed with their educational purpose in mind, their ability to be incorporated within a range of pedagogical approaches is important. However, the CD-LOR project is not working within a narrow or rigid definition of LOs; rather, the stakeholder communities involved in the project, in particular the Associate and Collaborative Partners, will have their own definitions of what constitutes a useful chunk of teaching and learning material, including anything from simple assets like images, through formal LOs and aggregations of those, to more complex interactive resources, learning activity designs, exemplars and case studies. The concept that CD-LOR will explore is the usefulness of repositories of such teaching and learning materials in support of learning communities. The term "LO repository" is intended only as useful shorthand for organised collections of digital teaching and learning materials.

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<sup>8</sup> [http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/index\\_files/partners.htm](http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/index_files/partners.htm); see also *Appendix 2* for a brief summary of each Associate Partner.

<sup>9</sup> [http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/index\\_files/steeringgroup.htm](http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/index_files/steeringgroup.htm)

<sup>10</sup> In collaboration with the RepoMMan project, based on their initial survey of researchers and the research development process: <http://www.hull.ac.uk/esig/repomman/documents/index.html>

<sup>11</sup> For an early review see Neven & Duval, 2002.

<sup>12</sup> E.g. IEEE, 2001; Koper, 2001; Wiley, 2000.



## 2.2 Why CD-LOR?

LORs, as with many other learning technology innovations, have often “seemed to be designed to exploit the capabilities of the technology rather than to meet an instructional need” (Koschmann, 1996, p. 83). This focus on technology has resulted in much useful research on issues such as interoperability standards and specifications; levels of granularity and aggregation of LOs; and resource management, description, discovery and delivery. However, pedagogical, social, and organisational factors have not been at the forefront in the design and development of LORs. Moreover, the implementation of LORs in support of learning communities is still relatively immature. In 2003, Campbell (2003, p.36) heralded a shift in focus “in an attempt to identify and analyse the factors that influence practical uptake and implementation of learning objects”. Koper et al (2004, pp.21-35) found more recently that, in spite of the growing availability worldwide of reusable LOs and LORs, educators still have to “cope with major problems when trying to find, retrieve, adapt or use materials”. Their own experience was that “efforts required to reuse objects in most cases outweigh possible advantages. This is especially true when the objects are developed in different institutions. In many cases, course developers have decided that it is easier to (re-)create the materials themselves rather than reusing them from others.” Koper et al therefore initiated a step in the direction of looking at learning communities by developing the beginnings of a theoretical framework based on social science research to describe the requirements for the development of a successful LO exchange community. Campbell, Koper and others have thus provided the inspiration for the CD-LOR project to build upon. This report is the starting point for the project in further unpacking the issues so that we may provide LOR guidelines more specifically tailored for a range of different learning communities.

## 2.3 Barriers in using LORs to support teaching and learning

There has been much discussion in the e-learning world relating to barriers to uptake and use of LORs. In this section, we review what those barriers are thought to be, keeping in mind the project viewpoint of supporting learning communities. In the following section (2.4) we briefly summarise proposed solutions.

The reuse of learning materials has been an issue since the 1970s. At that time, a number of attempts to promote reuse of educational software outside its original market took place (Bork, 1976; Hershfield, 1987). These attempts largely failed due to technological barriers such as incompatibilities in operating systems and storage media, as well as problems related to user awareness and access (Strijker, 2004). The most substantial problems, however, related to the local context and culture of the end users (Ely, 1989 cited in Strijker, 2004).

Reuse of resources in the context of LORs and learning communities continues to be problematic. Dobson, LeBlanc & Burgoyne (2004) argue that ignoring social and organisational factors while designing LORs often results in “...poor matches with users’ needs, misalignment with change policies and plans, confusion of roles and responsibilities in practice, and as a consequence, often very poor levels of technology uptake and use” (p. 2). Dalziel (2005) has also noted that the vaunted “learning object economy” has not become a reality as quickly as had been hoped, and argues that to enable reuse and sharing the following principles should be adopted:

- Focus on learning design/learning activities rather than content
- Focus on community rather than repository
- Easily adaptable rather than static resources
- Close integration of learning platform and the community for sharing<sup>13</sup>.

Collis (1995) suggests four broad groups of barriers to sharing and reuse of learning resources. These include *socio-cultural factors*, such as language and style of communication, cultural identity

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<sup>13</sup> These principles can be seen in action in the LAMS Community, set up by Dalziel and colleagues around a repository for sharing learning activity designs created using the LAMS tool:  
<http://www.lamscommunity.org/>

and sensitivity, cultural perceptions of roles of teacher and student; *educational factors*, such as need and relevance, curriculum fit, pedagogical approach; *organisational factors* such as institutional decision-making procedures, copyright and ownership, cost-related issues, marketing, maintenance and management of the development and distribution processes; and *technological factors*, such as usability, interconnectivity, and interoperability issues (pp. 80-81). These groups of issues are intertwined: for example, pedagogic issues have associated technological and socio-cultural dimensions; and the information management issues are closely connected with the technological issues. In this section, specific issues within these four categories of barriers will be discussed.

### 2.3.1 Socio-cultural issues

Research has identified culture as a critical variable that can impact reuse (Hershfield, 1987; Markus & Gould, 2001; Seufert, 2002). Culture can be defined in many ways. A typical definition is “shared motives, values, beliefs, identities, and interpretations of meanings of significant events that result from common experiences of members of collectives and are transmitted across age generations” (House et. al, 1999). Culture can be understood on different levels, i.e. organisational culture (such as higher education vs. further education); the culture of professions (such as the culture of teachers vs. learning technologists); the culture of disciplines (culture of so-called “hard” vs. “soft” sciences); or national or ethnic cultures.

A number of socio-cultural dimensions can have implications for utilisation of LORs, for example cultural models and expectations in terms of learning and sharing; expectations in terms of collaboration, interaction, and hierarchies; community size, member proximity, and types of tasks for which LORs are used; language and visual aspects of LOR user interfaces; infrastructure, access and technology skill differences; expectations in terms of roles within communities (e.g. learner and teacher roles); human-computer interaction and tolerance of new technology (Collis, 1999; Seufert, 2002).

Cultures may differ in preferences for communication patterns and styles, for example, a culture of egalitarianism (i.e. levelling of status) may support collaboration, sharing and contribution (Watson, Ho, & Raman, 1994). However, what is acceptable in terms of hierarchies and status will be differently perceived within different organisational and national cultures. Similarly, expectations and norms related to horizontal communications (for example, between students in a class or teachers in a community of practice) and vertical communications (for example, between teachers and students) vary between cultures (Jin & Cortazzi, 1998).

In addition, different cultures pose different expectations on teacher roles and student responsibilities (Jin & Cortazzi, 1998). This might impact acceptance and utilisation of LOR models involving student contributions.

Culture can also be a variable in terms of the visual aspects of the LOR interfaces and use of metaphors (e.g. icons), and this can be particularly an issue for the LORs targeting multinational communities. Metaphors that are common and intuitive in one culture may be rare in others (Griffith, Heppel, Millwood, & Mladenova, 1994; Marcus & Gould, 2001).

Infrastructure differences and the amount of competence and comfort cultures have with technology use can differ too (NODE, 1998). In addition, there is a discrepancy between cultures on the willingness to welcome and acceptance of trial and error on new technologies. Some cultures may prefer more precise processes and less uncertainty (Nakakoji, 1993).

Organisational cultures must be taken into account too. ‘Doing things differently’ may not be acceptable and the quality will be doubted (Booremans, 1996; Collis, 1998). Decontextualisation of LOs may lead to the not invented here, or even “not adapted here” syndrome (N. Ballantyne, personal communication, 2006). Cultural norms inherent in educational sectors differ too – for example standardisation of curricula in schools and further education institutions implies pre-determined, shared learning objectives. This could potentially promote reuse of resources focused on these objectives. Conversely, non-standardised curricula, common in higher education, may

inhibit reuse because resources will have to target a range of different objectives (Littlejohn, Jung, & Broumley, 2003). This is not only a cultural, but a pedagogic issue as well.

### 2.3.2 Pedagogic issues

Abbey (2005) notes that “pedagogical change is overshadowed by an overemphasis on technological change...contemporary pedagogical issues... [are] either glossed over or ignored in a discourse dominated by technology” (p. 6). Pedagogic issues, along with the socio-cultural ones, are arguably the most complex and difficult to deal with. These two knowledge areas (i.e. pedagogy and technology) evolved independently from each other and were developed by distinct professions with independent traditions and language of discourse. However, as Zarach & Corley (2005) note, “maturing of e-learning means that they are under increasing pressure to work more closely together.” (p. 1).

As mentioned in the previous section, a major barrier in utilisation of LORs has been teachers’ perception of the misfit of the material created elsewhere with their own learning setting, particularly in higher education where the emphasis is on non-standardised curricula (Collis & Pals, 2000). Strijker (2004) mentions a number of what he calls “likelihood-of-use issues”, such as teachers’ motivation to share and reuse LOs; teachers being supported in making decisions, not only about how to find appropriate LOs but how to integrate them into the rest of the course and curriculum (different forms and amount of support will be needed depending on teachers’ experience and pedagogical approach); and easy-to use tools to make such integration possible in a cost-and time-effective way (return on investment) (p. 5). Creating resources *for sharing and reuse* places more demands on the teachers for which they are not trained, as this involves complex issues about granularity of objects and preserving their educational context. Increasingly, teachers must adapt to shift in roles from content designers to learning activity designers, managers and facilitators. At the same time, it has been noted that creating teaching materials is one of the creative and enjoyable roles that teachers have, and this may in fact be a little-acknowledged barrier to them reusing other people’s materials (Pegler, 2005).

In describing their experience with using LOs, Weller, Pegler, and Mason (2003) outline a number of pedagogic issues that arose, including loss of educational narrative due to the autonomous nature of LOs; ensuring sufficient student coverage of course content (lack of integration of LOs makes the course potentially more open to minimal student approach); balancing student interaction with flexibility in study patterns (modularisation of learning experience by the nature of LOs); balancing variety in objects with the need of cohesive approach allowing for academic progression (maintaining learner interest and motivation).

Another subset of issues in utilisation of LORs results from diversity in approaches to learning (such as teacher-centred vs. learner-centred approaches). Discussing effective educational scenarios and the role of technology in supporting these scenarios, Sjoer and Dopper (in press) emphasise the importance of learner-demand driven educational models versus teacher-driven educational models, where knowledge is freely available. However, this scenario is challenging not only technically and organisationally, but also in terms of human factors such as willingness of teachers to adopt this scenario. Teacher-centred pedagogic approaches have traditionally been focused on content delivery (Mayes & de Fretas, 2004). Similarly, LOR utilisation models have predominantly focused on delivery of resources. However, user-/learner-centred approaches require that LORs enable users not only to access resources but also to construct knowledge (McGill et al, 2005; Nicol, 2004). This necessitates LOR utilisation models where resources are created and uploaded not just by teachers or librarians, but also by collaborative groups of learners, and jointly with the teachers and others in the community.

Discipline-specific teaching and learning models as well as types of knowledge these disciplines work with (Becher & Trowler, 2001; Meyer & Land, 2002) also can impact utilisation of LORs (Andrew, 2003; Russell, 2005; Pearce, Gulc, & Grove, 2005). For example, Russell (2005) suggests that while constructivist models of learning have been largely promoted, disciplines with a strong positivist tradition and well-established body of knowledge (such as biology, chemistry, mathematics) question the value of constructivist approaches such as discovery learning. With respect to LORs, she argues that “...in general scientists and engineers are more comfortable with

the concept of digital learning objects than academics from the humanities. For the former, knowledge and learning are about, or even embodied in, physical objects. For the latter, knowledge and learning are individual or social processes" (p. 66). Discipline-specific traditions in terms of ways of collaboration and communication can be another factor that could influence utilisation of LORs. For example, McGill et al. (2005) note that engineering design teams often work in distributed modes where effective sharing of information and resources is important. So it is likely that learning communities within such disciplines will be more likely to use LORs. In a study looking at trends in uploading resources to a research repository by academics, Andrew (2003) found that most contributions occurred in science and engineering (particularly informatics, mathematics and geosciences), while the lowest number of contributions came from humanities and social sciences (particularly law, history and classics, and literature and languages). Although there is more research needed to understand the reasons underlying these trends, it is clear that disciplinary differences can influence utilisation of LORs. The variables underlying these trends are likely to interact in complex ways. For example, influencing factors may include discipline-specific approaches to knowledge representation (e.g. representation of equations in mathematics) and access to and familiarity with technology tools and resource formats (Littlejohn, 2004).

Users' skills and information literacies are another important pedagogic aspect of utilisation of LORs. Ability to find, assess, and use information is increasingly being recognised as a key learning skill. Information literacy becomes even more important in the context of the modern information age and changing educational terrain. Williams (2005) notes a changing emphasis from finding information to using information: "information literacy has moved on...from skill-based approach focusing on sources of information to a concept that encompasses skills, knowledge, values, and attitudes towards the educational and social use of information" (p. 54). Information literacy skills involve the ability to recognise a need for information, search and find information using appropriate search strategies, critically evaluate information with respect to its quality and fit for particular need, and organise and archive information in an efficient way (Doyle, 1994 cited in Williams, 2005, p. 51). Users (particularly, but not exclusively, students) often require preparation and support in information literacy in order to access and use LORs.

### **2.3.3 Organisational and information management issues**

Organisational barriers involve both inter-organisational and intra-organisational issues, as well as information management issues. Currently, there is little clarity as to how LORs link with organisational strategy, mission, and objectives. For example, how can LORs support the overall strategy and mission of the institution? How can they facilitate specific teaching and learning or staff development objectives? How can they link with institutional knowledge management strategies? This lack of alignment with organisational strategy may result in limited "buy-in" from management and poor integration within organisational structures. This in turn leads to lack of support within organisational structures for the utilisation of LORs. New support structures require a shift in roles and responsibilities, as well as institutional stewardship models for managing digital content and activities. Nicol (2004) argues that "much greater coordination will be required across academic, support and administrative staff...Individual roles and responsibilities will change, and new roles will emerge as repositories become embedded in organisational systems" (p. 15). These new roles and responsibilities create a need for new management processes with respect to learning and teaching, as well as institutional assets. It has been argued that for reuse to become mainstream, a culture change is needed whereby reuse is embedded in institutions and their educational strategies. Baldwin (2004), in a review of the JISC X4L Programme, notes that reuse "could stimulate cultural change in teaching and learning, as teachers have to rethink how they deliver their courses and focus on how to improve the quality of the learning experience". The main barriers to cultural change pinpointed by this review included time, skills, access to technology, institutional attitudes, and age-related inertia (Baldwin, 2004, pp. 17-18).

Lack of incentives linked to user motivations and goals is a major issue at the organisational level. As one of the findings of a JISC-funded ACETS project indicates: "without motivation and clearly perceivable need teachers will be unlikely to overcome the difficulties associated with using existing third-party materials. If widespread reuse is a strategic goal of the JISC or other agencies or institutions then a more sympathetic environment is going to be required. In the absence of such a change, reuse will remain a minority activity, championed by some but failing to gain

*CD-LOR Deliverable 1: Report on Learning Communities and Repositories* widespread support” (Ellaway et al, 2005, p. 3 ). Intrinsic incentives include user perspectives on the added value of the LORs and how they might support their practice. Therefore the lack of demonstrated value might inhibit users’ motivation to share and reuse resources. Extrinsic incentives include, for instance, monetary rewards and enhanced reputation of individuals and their institutions (Campbell, 2003).

Another set of organisational factors relates to information management issues such as lack of policies and procedures for intellectual property rights; clear understanding of the underlying activities within the communities and implementation of workflows to support these; mechanisms and policies for quality assurance of resources and facilitating retrieval of resources with good quality metadata. Each of these are broad and complex topics and cannot be addressed in this report to the depth they deserve (neither are they the focus of this project); however some are briefly elaborated below.

Digital rights management (DRM) relates to the management of intellectual property rights involved in creating, sharing, acquiring and reusing resources within LORs. A multidimensional issue itself, DRM includes legal, technological, policy- and standardisation-related aspects. For a review of these issues see Robson (2004). A recent review of the JISC Exchange for Learning (X4L) programme identified the following IPR issues:

- Finding out what IPR is and understanding IPR law
- Asking permission to use third-party resources
- Acknowledging third-party content appropriately in the learning objects
- Acquiring permissions
- Keeping records of permissions granted
- Getting necessary releases to make resources available in repositories (Baldwin, 2004).

The JISC Digital Repositories Programme project TrustDR<sup>14</sup> is looking specifically at IPR issues for LORs, and is collaborating with CD-LOR to ensure that relevant issues are noted and incorporated across both projects without undue duplication of work.

A subset of information management issues relates to quality assurance and facilitating retrieval of resources. Metadata – ideally detailed, accurate and consistent information about resources - has been argued to be “a key to unlocking the potential of learning object repositories for reuse” (Currier, et al, 2004, p. 8), in that it enables effective and efficient resource discovery and selection. Currier et al. (2004) outline the following key issues that require investigation with respect to metadata:

- Cultural factors, e.g. ownership of metadata by resource creators
- Criteria for good quality metadata both in terms of individual repositories as well as globally
- Interoperability (technical and semantic) of metadata across contexts
- Who should create metadata and feasibility of collaborative creation of metadata
- Tools to facilitate creation of metadata
- User support and training in creating metadata
- Costs and benefits associated with the various approaches to metadata creation
- Linking metadata application profile development (i.e. elements and vocabularies) to the actual search strategies that users employ to find materials within LORs (pp. 18-19).

(Lack of) user skills in creating metadata are a major issue (e.g. Barker & Ryan, 2003), and various strategies for user support have been proposed (e.g. Currier, 2001). Currier et. al (2004) suggest collaborative approach to metadata creation by resource authors and metadata specialists. Pockley (2004) emphasises that such collaborative production of metadata [within communities] will be dependent on cultural and technical integration of applications, processes and planning: “Technical integration is a waste of time without cultural integration, because it will be seen as a form of totalitarian control and lead to the emergence of data islands. Cultural integration will

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<sup>14</sup> <http://www.uhi.ac.uk/lis/projects/trustdr/>

quickly dissolve without technical integration because separate systems rapidly create separate cultures” (p. 77).

### **2.3.4 Technological issues**

A range of technological issues with the utilisation of LORs discussed in the literature is focused on usability, utility, ease of use, and effectiveness of LORs. Strijker (2004) proposes that technological issues can be grouped around the following four levels of technology involving learning objects:

- Technology of the learning objects themselves (e.g. the reference model for metatagging)
- Technology related to the repository in which the objects are collected (database technology, LCM)
- Technology for services related to the use of repositories (e.g. search, browse, download, and preview tools)
- Technology to support the sharing/interoperability of LOs between systems and repositories (p. 4)

Because this study focuses on the cultural and organisational dimension of learning communities, the last two points are of particular relevance: interfaces between the LORs and other types of repositories as well as other tools that communities and the individual members use are a key issue. Heery and Anderson (2005) note that “fulfilling stakeholders’ expectations...will rely on sometimes complex interactions between repositories and other components of the information environment” (p. 3). These components include personal information management tools and strategies as well as institutional CMSs, VLEs, administrative systems and library catalogues, and other national, regional and international repositories. Key questions are: How can LORs enable users to have control over their resource sharing? What are potential models of reuse based on peer-to-peer as well as group sharing? How can informal collections of resources gathered and/or created by learners be linked with more formal repositories?

## **2.4 Solutions: enablers for utilisation of LORs to support learning within communities**

This section looks briefly at what the literature says about proposed solutions to the known barriers named above in *Section 2.3*. Because there has not been much published evaluation of solutions, at this stage we give only an overview of types of solution rather than detailing specific solutions. The next phase of the project will gather use cases from the project partners describing specific solutions that CD-LOR will implement, test and evaluate. This section is structured around the four main categories of issues reviewed so far (*Sections 2.4.1-2.4.4*). In addition, the overall issue of implementation of LORs is discussed from the change management perspective (*Section 2.4.5*).

### **2.4.1 Solutions to cultural issues**

The cultural barriers are arguably the most difficult to solve, due to the complexity and a wide range of tacit variables involved. However, it is proposed that:

#### **Design of the LORs should be based on understanding of cultural norms and expectations of the user communities**

Designing for flexibility and adaptation must be the overall goal. There has been a lot of research into what flexibility means in terms of VLEs and www-based learning support in general, and LORs can benefit from considering the findings and solutions developed so far. More research is needed in order to operationalise what flexibility and adaptability mean in terms of LORs; this is intended to be something that the findings of CD-LOR will inform and support. However, as Collis (1999) emphasised “...increased flexibility is a necessary but not sufficient base for cultural sensitivity... That sensitivity needs to come from better skills and more wisdom in terms of listening to and observing persons from cultures outside our own. This is a human activity, not a technical issue” (p. 12).

## **2.4.2 Solutions to pedagogic issues**

As with cultural barriers, pedagogic issues are challenging, but need to be tackled to avoid situations where large investments are made into development of learning objects and repositories that largely remain unused. Some possible solutions are outlined below:

### **Pedagogy pull vs. technology push**

Development of LORs and as well as the entire reuse agenda should be driven by pedagogy/user pull rather than technology push. It is important to first identify explicitly the market/users and user needs so that the market then could identify the technology requirements. Any educational technology and tools such as LORs should be understood in the context of use, and the pedagogic, socio-cultural, and organisational variables should be paid greater attention to.

### **Funding initiatives to target the developments with a pedagogic vision rather than technology-driven developments**

Nicol (2004) argues that a reason for the focus on tools and technological systems is that “it is easy to see the outputs of systems development whereas the outputs in terms of effective usage take much more time to realise” (p. 13). Longer-term focus will be needed to ensure utilisation of LORs, and funding models can be a major variable for successful implementation. McKenzie et al (2006), in a major international survey focusing on factors impacting upon implementation of ICT innovations (including repositories) in higher education, found that a number of features of granting schemes could encourage wider adoption and implementation of these innovations. They found that “staged and supported bidding for funds, clear descriptions of what will be funded, strong requirement for evaluation, adoption-focused approaches to dissemination, consultation, collaboration and support for ongoing dissemination after project completion are required” (p. xi).

### **Development of LORs by multidisciplinary teams**

The gap between technology and pedagogy can be bridged by ensuring that LORs are developed by multidisciplinary teams made up of learning designers, teachers/subject-matter experts, information specialists, and learning technologists, using rapid prototyping models of design and development, based on thorough end-user needs analysis and involvement of users at each stage of design, development, and testing.

### **Examples of successful use of LORs**

Availability of exemplars or case studies of successful use of LORs in teaching and learning could be a useful way of supporting the implementation. These exemplars and case studies could be made available either through the LORs themselves or through workshops and training sessions provided by the project teams or staff developers.

### **LOR models involving co-construction of resources by the students**

LORs that involve co-construction of resources by the learners (e.g. DIDET) can be a useful model to facilitate learning, particularly in terms of how learners work in groups, how they determine the quality of resources, where they find the resources, how they do metatagging, and how these models accommodate both individual learners as well as collaborative groups.

### **Demonstrated impact for learning and added value for individual users**

More research is needed to collect evidence that LORs can positively impact learning and teaching processes on the level of individuals, communities, and organisations. The value of LORs should be demonstrated to the user communities, through showing how the LORs add value, save time, or solve problems.

### **User development and support in information literacy**

In LOR development and implementation strategies, it should be explicitly planned for user education and support in information literacy, particularly resource discovery, customisation and integration. Such support should be based on understanding of skill gaps and community needs in information literacies, as well as personal information management strategies and tools used by individual users within the communities.

### 2.4.3 Solutions to organisational and information management issues

Organisational and information management issues require systemic solutions. Some suggestions are outlined below:

#### **Incentives and rewards linked to community needs and goals**

Different models of incentives and rewards will be appropriate for different communities. Incentives could be both monetary (for example, payment for contributions) and non-monetary (for example, peer review and recommendation). Needs, goals and underlying motivations of the communities need to be investigated and understood in order to provide the most appropriate incentives.

#### **LORs linked to organisational strategy and objectives**

Development of LORs should clearly fit with the institutional strategy and the learning and teaching objectives. Management buy-in is a key variable in implementation of LORs.

### 2.4.4 Solutions to technological issues

Solutions to technological barriers are important in increasing usability, interoperability, pedagogic effectiveness and efficiency of LORs.

#### **Facilitating ease of use, engagement, efficiency and pedagogic effectiveness**

It is important that tools focus on facilitating ease of use, user community engagement, efficiency and pedagogic effectiveness. This involves usable tools, processes and standards for metatagging, search, retrieval, and workflows.

#### **Conceptualisation of technology as a context rather than isolated tools**

LORs should be viewed as a context for learning activities that engage learners in knowledge construction. LORs are more than just software – they should engage learners and support knowledge construction, development of cognitive learning strategies and critical thinking skills. LORs will be more likely to support knowledge construction when they are driven by the needs of the learning community and individual users, when interactions are initiated and controlled by learners and when the interactions are meaningful and intellectually engaging (Jonassen, 1995).

#### **Effective policies and practices for metadata creation**

Metadata creation should be based on effective and robust policies and practices, which in turn must be based on understanding of users strategies in search and reuse of resources. As Currier et al. (2004) suggested, collaborative approaches to metadata creation (i.e. involving both resources creators and metadata specialists) may be necessary, and indeed are already being implemented by Jorum.

### 2.4.5 Some considerations from a change management perspective

Many of the issues underlying the implementation of LORs discussed in this report are essentially change management problems or problems of diffusion of innovations (Rogers, 1995). To enable uptake and use of LORs, it might be important that explicit innovation management strategies are planned for and incorporated in the development stage by LOR curators and funding bodies. Rogers (1995) outlines the following key factors that could enable adoption of innovations:

- Relative advantage - potential users need to see an advantage for adopting the LOR
- Compatibility - LORs need to fit in with potential users current practice and values
- Complexity - ease of use of LOR will lead to more rapid adoption
- Trialability – potential users want to be able to “test” before adopting
- Observability – potential users want to see observable results of adopting repositories

In their acceptance of an innovation people move through several stages, and to promote new practices a strategy that corresponds to the stage where people are is needed. Dormant (1997) outlines the following stages of acceptance of innovation and suggests strategies for each of these stages (*Table 1*):



**Table 1. Strategies to enable acceptance of innovations (Dormant, 1997, p. 144)**

<b>If the person is in the stage of...</b>	<b>Then the strategy to use is to...</b>
<b>Awareness</b> <input type="checkbox"/> Passive regarding the change <input type="checkbox"/> Little/no information about change <input type="checkbox"/> Little/no opinion about change	<b>Advertise</b> <input type="checkbox"/> Be an ad agent <input type="checkbox"/> Be credible and positive <input type="checkbox"/> Appeal to his or her needs and wants
<b>Curiosity</b> <input type="checkbox"/> More active regarding change <input type="checkbox"/> Expresses personal job concerns <input type="checkbox"/> Asks questions about own work and change	<b>Inform</b> <input type="checkbox"/> Identify specific concerns <input type="checkbox"/> Provide clear info about concerns <input type="checkbox"/> Emphasize pluses, acknowledge minuses
<b>Envisioning</b> <input type="checkbox"/> Active regarding change <input type="checkbox"/> Expresses work-related job concerns <input type="checkbox"/> Asks questions about how change works	<b>Demonstrate</b> <input type="checkbox"/> Give success images <input type="checkbox"/> Provide demonstrations <input type="checkbox"/> Connect with peer users
<b>Tryout</b> <input type="checkbox"/> Active regarding change <input type="checkbox"/> Has opinions about change <input type="checkbox"/> Interested in learning how-to	<b>Train</b> <input type="checkbox"/> Provide effective training <input type="checkbox"/> Provide job aids, check lists <input type="checkbox"/> Promise technical follow-up
<b>Use</b> <input type="checkbox"/> Active regarding change <input type="checkbox"/> Uses change on the job <input type="checkbox"/> Asks detailed questions about use	<b>Support</b> <input type="checkbox"/> Provide necessary technical help <input type="checkbox"/> Provide reinforcement <input type="checkbox"/> Provide recognition

Too often solutions are limited to training and user support. However, if potential users and communities are at the awareness stage, there could be little use to push them to use new things or provide demonstration or make training available. Such strategies could be even counter-productive. Along with solutions to the specific issues discussed in this report, alignment of user awareness level, needs and implementation strategies could help enable uptake and use of LORs.

## 2.5 Learning communities

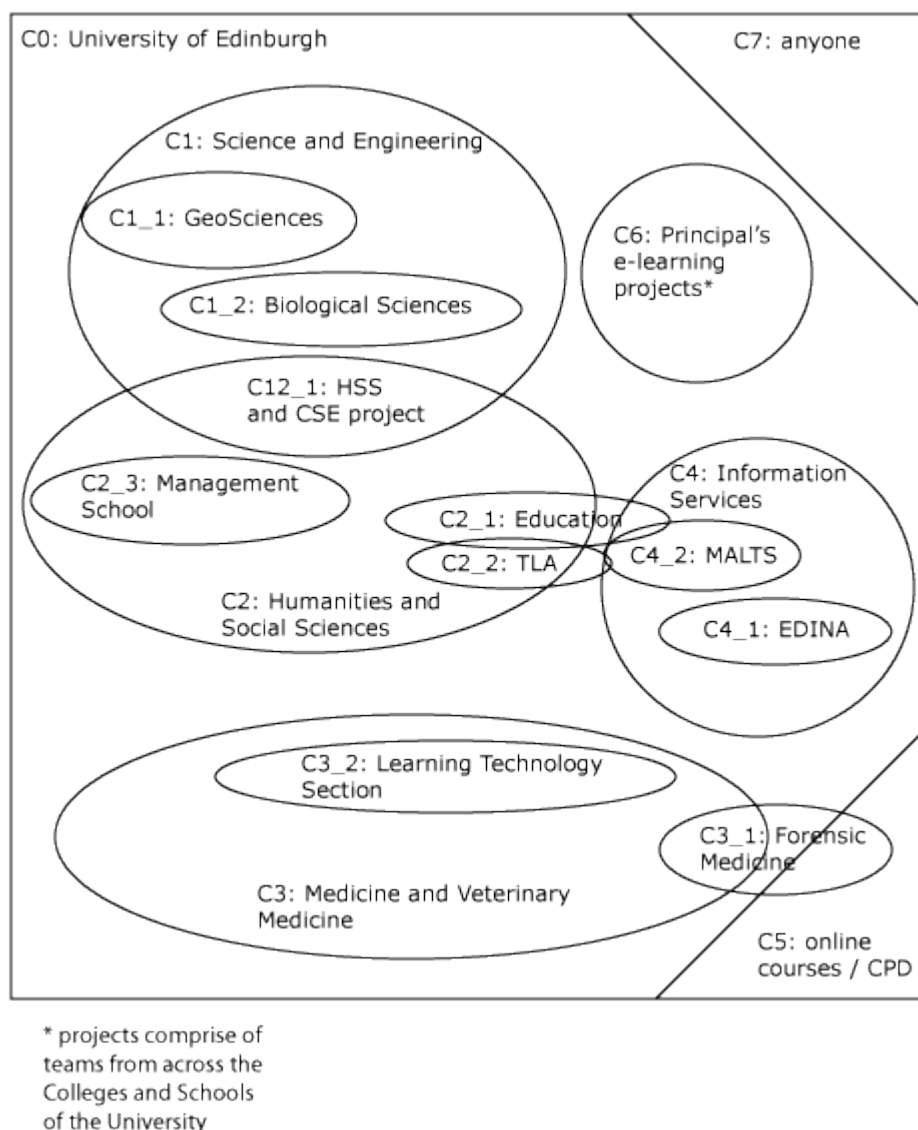
In this section, many of the same issues that emerged in *Sections 2.3-2.4* through the literature review on barriers and solutions to LOR uptake and use appear again, through a different lens; that of learning communities. It was the clear goal of CD-LOR to begin to look through this new lens, however, as when breaking any new ground, there are challenges. The thinking and ideas outlined throughout this report, but particularly within to this section, will be further refined through the life of the project. In particular, we aim to achieve increased integration between our thinking on LOR barriers and solutions, and how this maps to learning community issues.

### 2.5.1 Defining communities for CD-LOR

Defining what CD-LOR means by “communities” proved to be somewhat problematic in the early stages of the project, given the diverse and wide-ranging theories and studies of communities available, e.g. the currently fashionable communities of practice idea (Wenger, 1998), communities of inquiry and so on. CD-LOR started from the simple idea that, generally, LORs are set up to support the teaching and learning needs of one or more communities, broadly defined as a group of stakeholders<sup>15</sup>. However, in many cases, repositories may be set up with the expectation or hope that a particular community of users will coalesce around it out of that broader community of stakeholders, therefore how such a community may be encouraged, supported and developed is of particular interest. In CD-LOR’s terms then, it is useful to distinguish between a core group of *end*

<sup>15</sup> In this, CD-LOR follows the lead of the OAIS Reference Model (an ISO Standard for describing digital collections, which are known in the standard as Open Archival Information Systems). OAIS defines an Open Archival Information System as an “archive, consisting of an organization of people and systems that has accepted the responsibility to preserve information and make it available for a Designated Community”. ‘Designated Community’ is simply defined as the “community of stakeholders and users that the OAIS serves.” (Patel, 2006).

*CD-LOR Deliverable 1: Report on Learning Communities and Repositories* users and the wider community of *stakeholders*. Both of these groups can include teachers, students, support staff and managers. For example, in the case of Jorum<sup>16</sup>, the broader community could involve all of UK HE and FE; in case of the SIESWE Learning Exchange<sup>17</sup> it is currently the Scottish social work education community; in the case of LORE<sup>18</sup> the community is intended to be all the staff of Edinburgh University. In all three cases, however, repository curators are hoping to encourage use of their repositories by developing policies and tools that encourage users to feel part of a community around the repository itself. In *Figure 1* below, an informal illustration developed by the LORE project officer to show their repository software provider the configuration of communities *within* Edinburgh that the repository is intended to serve, gives a good example of how even a single institution may evince rather overwhelming complexity.



**Figure 1. Communities served by LORE<sup>19</sup>**

In investigating these two levels of 'community' in relation to LORs, a further challenge to CD-LOR became evident: while all of CD-LOR's partners had some idea of the stakeholder community they were providing a repository for, very few had already achieved any kind of active user community around their repository. Indeed, for most the hope is that working with CD-LOR will facilitate just such community development in a manner that is grounded in current theory and knowledge, and evaluated in a way that allows lessons to be quickly assimilated and disseminated.

<sup>16</sup> <http://www.jorum.ac.uk/>

<sup>17</sup> <http://www.sieswe.org/learnx/>

<sup>18</sup> <http://www.lore.ed.ac.uk/>

<sup>19</sup> Diagram by Sarah McConnell, University of Edinburgh LORE, contact: [sarah.mcconnell@ED.AC.UK](mailto:sarah.mcconnell@ED.AC.UK)

The hypothesis underlying CD-LOR is that issues that are likely to impact upon the successful uptake and functioning of a repository are directly related to key factors of the community or communities it aims to serve or facilitate. In other words, the way a repository is used is likely to depend upon the nature of the community and how it is organised. Ultimately, although definitions of the different types of communities vary (e.g. Wenger, 1998; Wilson & Ryder, n.d.; Koper, Rusman & Sloep, 2005), the common key aspects include some form of a shared goal (formal or non-formal), shared interest or shared practice and shared repertoire of tools, processes, and concepts.

## **2.5.2 Learning communities and pedagogy**

If our starting point is the idea that the way LORs will be used depends upon the nature and organisation of the community it serves or facilitates, then we can begin to map out a range of factors that may be involved, such as (Margaryan, Littlejohn, & Nicol, 2006):

- motivations of community members;
- their roles, status and relationships within the community;
- existing rewards and incentives for sharing and using LOs within that community;
- who controls resource access and use;
- the size of the community and its effectiveness;
- the spatial location of community members and modes of communication employed (for instance, do they communicate predominantly online or is face-to-face communication possible?);
- community ground rules and how these develop and are supported;
- the reconciliation of multiple agendas;
- the rhythm of the community and its maintenance;
- whether the community is perceived as open or closed.

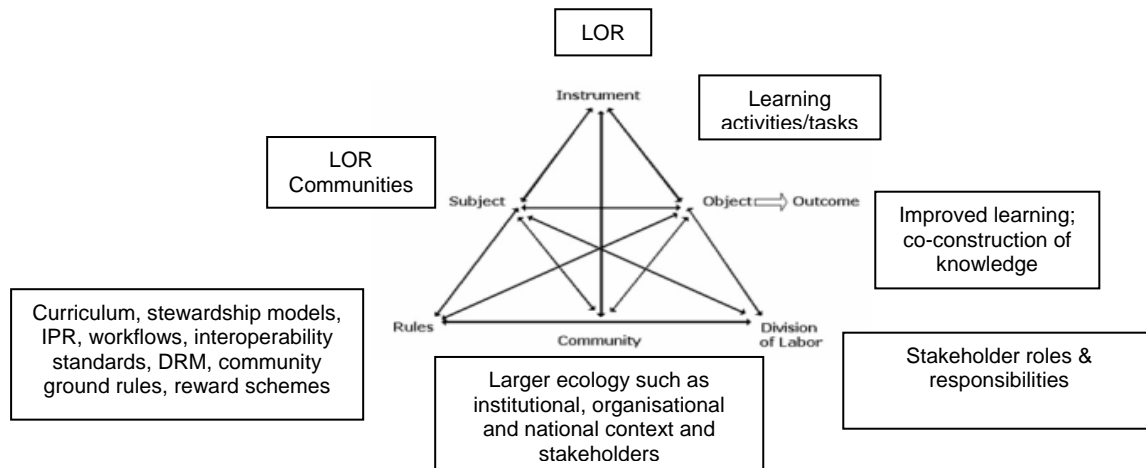
Communities differ in their cohesiveness; some communities are tightly knit with members having close connections, high motivation to share, and a good degree of trust and shared values, whereas other communities may be loosely confederated, with membership being more transient and conditional. But what are the particular issues with communities in an educational context: learning communities?

Currently popular educational theories characterise learning as constructive, self-regulated, goal-oriented, situated and/or collaborative. Therefore, it is reasonable to surmise that, if LORs are to support learning, they should be designed as environments that enable a collective, participatory process of active knowledge construction, reconstruction and reuse. As within the mainstream of VLE development, the main focus of research surrounding LORs has been on the management of digital learning resources and delivery of content, rather than on how repositories might be used to support a diverse range of educational models. To ensure successful uptake and use of LORs to support learning, it is crucial that the thinking around the use of LORs broadens the idea of content delivery towards considering the use of resources as well as the management of resources.

## **2.5.3 Investigating learning communities and repositories: Activity theory**

With considering resource use in mind, learning resources may be viewed primarily in the context of learning activities of users within the communities. Sociocultural theories of learning (Leontiev, 1978; Vygotsky, 1978) have emphasised that learning activities are situated in a social context and driven by learners' goals and motives. Therefore activities are outcome-oriented, and motivation and goal-formulation are inherently social. They are influenced by prior experiences, interpretation of the expectations of others, and identification of the strategic purpose and value of personal actions. Thus to effectively support learning within communities, the design of LORs should be guided by clear understanding of the learning goals and outcomes of these communities as well as typical activities that they engage in. The CD-LOR team felt that it would prove useful to find a way to unpack our understanding of how such goals, outcomes and activities might be related to LOR development.

One useful theoretical lens to investigate LORs and communities is “activity theory” (Engestroem, 1987). This theory offers a method of analysing LORs and communities as “activity systems” rather than loose sets of actors, tasks and purposes. Activity systems are socio-cultural settings where groups of community members have a shared goal and object, as well as a shared set of tools to act on the object to realise the goal. This tool-mediated action is conditioned by implicit and explicit rules and by a broader context of the community. It also involves division of labour among the actors in the community. When the communities interact with tools or artefacts (e.g. LORs) on some object (e.g. learning tasks) with a shared goal and desired outcome (e.g. co-construction of knowledge, improved learning), their interactions can be seen as an activity system. These relationships are shown in *Figure 2*:



**Figure 2. An activity system of a LOR community**

If, as noted above in *Section 2.5.1*, key aspects of communities include shared practice and/or a shared repertoire of tools, processes, and concepts, then LORs can be viewed as a shared tool or a core component of a range of practices, tools and processes that communities might use. It has been argued that tools can fundamentally change the nature of activity and can lead to creation of new types of activities (Jonassen & Rohrer-Murphy, 1999). The relationship between tools and activities is dialectic, in that tools are also changed by the ways in which they have been used. The implication is that as the way in which communities use the LORs changes over time, the activities of teaching and learning within the communities will potentially be transformed as well. However, communities also use other tools, both physical and conceptual – such as personal information management tools and strategies, learning resources, pedagogical theories, mental models - which have to be considered and re-thought in relation to the LORs when the latter are designed and implemented.

Activity theory as a way of looking at LORs and learning communities will be returned to as the project progresses. As the above diagram illustrates, however, the breaking down into the components noted is one useful way of examining the important characteristics of a learning community working with a LOR. This became important as CD-LOR considered the issue of typologies of learning communities.

#### **2.5.4 A typology of learning communities?**

The first two objectives noted in the CD-LOR Project Plan, which were to be achieved within this report, (p.3) are:

- “1. Creating a typology of learning communities, mapping their characteristics in relation to their use (or potential use) of LO repositories.
2. Identifying possible drivers, barriers and enablers to uptake and embedding of LO repositories within such communities.”

However, the usefulness of creating a typology of learning communities soon came under question as the project progressed. In the literature a somewhat broad typology of communities is described. For example, Seufert, Moisseeva, and Steinbeck (2001a) outline the following types:

1. *Work-oriented communities*, such as business communities, communities of practice (or situated learning communities);
2. *Research-oriented communities*, such as scientific communities in academia, research and development communities in business;
3. *Learning-oriented communities* (curricular learning communities), such as class-support communities, virtual university communities; and
4. *Hobby-oriented communities*, such as communities of interest and communities of fantasy/gaming.

While at first glance it may appear that the relevant types within this typology are 1. and 3., in fact there are relevant factors for LORs to be found within all of the types, e.g. there are some very successful hobby-oriented communities of interest already sharing resources (e.g. Flickr<sup>20</sup>, open source software communities) from which lessons may be drawn; there is increasing interest in the use of gaming technology in teaching and learning; plus an increasing recognition of the need for integration of resource development and sharing from research through teaching and learning and into the workplace. It is also clear that any given repository may touch on more than one of these and therefore mapping drivers, barriers and enablers to these individual types would not be the best starting point. Ultimately, this was felt to be the case however a typology of learning communities might be put together. CD-LOR therefore moved on to looking at key characteristics, or *dimensions* of communities, rather than a typology of discrete kinds of communities.

### 2.5.5 Community dimensions

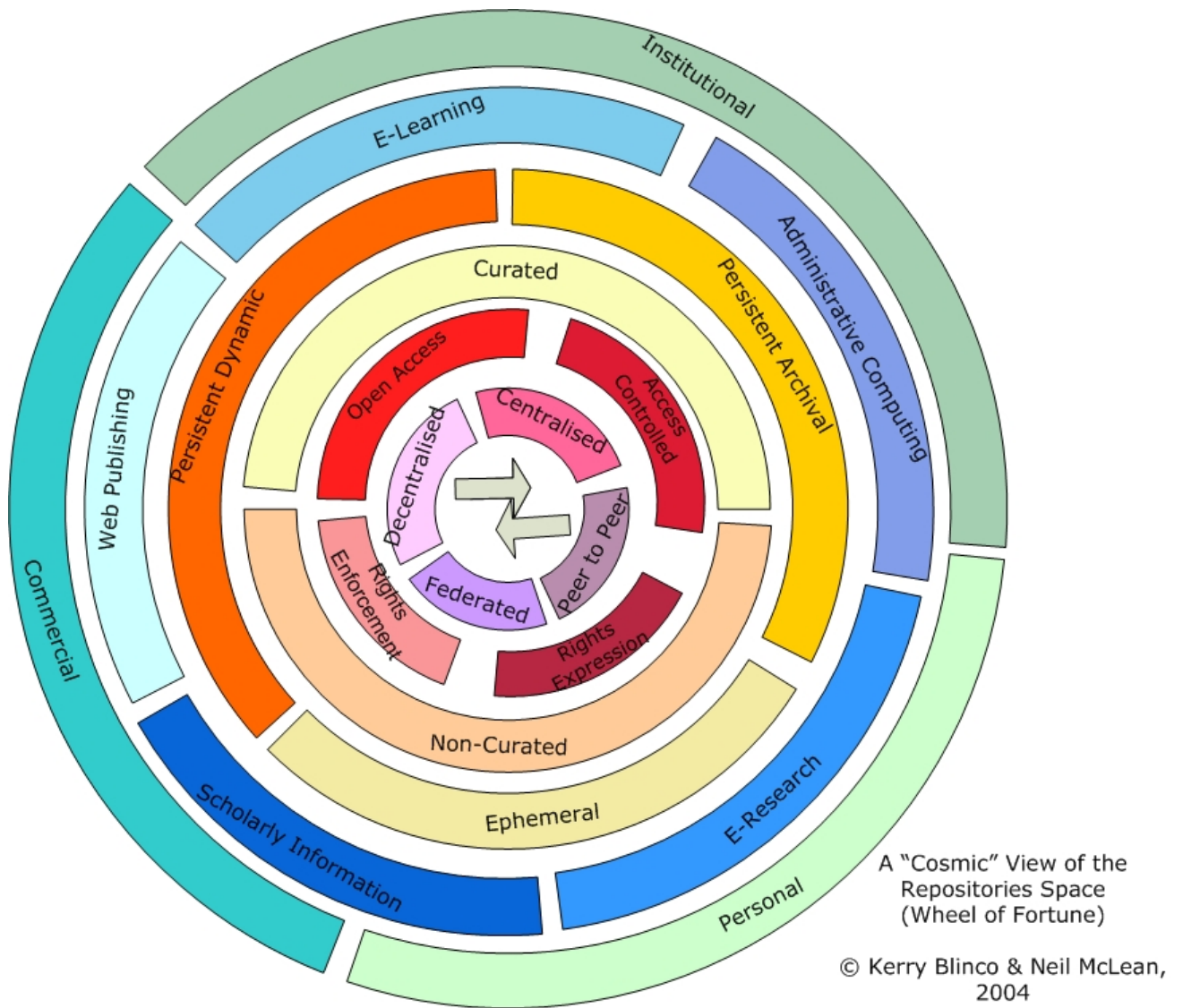
CD-LOR began by looking at dimensions in relation to characteristics of the repositories represented by the Associate and Collaborative Partners. This began with a review of various typologies of repositories that are currently under development elsewhere, to see if they would be of use to this work<sup>21</sup>. One of the foremost attempts to develop a meaningful and flexible typology of repositories, which could also be seen as a way of relating different dimensions of repositories, is the Cosmic Wheel of Fortune (MacLean, 2004), shown in *Figure 3* below<sup>22</sup>. This diagram is intended to be dynamic in that each wheel moves independently, thus allowing any given repository to be mapped across the six dimensions. It is intended to assist with understanding repositories right across the entire repositories domain, rather than just LORs, and is therefore broader in scope than is useful for the particular task CD-LOR is facing, although it has certainly been useful in highlighting certain areas that may impact on how a community may use a repository, and will likely still have usefulness as CD-LOR continues.

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<sup>20</sup> <http://www.flickr.com/>

<sup>21</sup> The JISC Digital Repositories Programme Support Team is working on gathering resources around and defining a broad ecology and typology of repositories, which CD-LOR will eventually feed into, see: [http://www.ukoln.ac.uk/repositories/digirep/index/Themes#Ecology\\_and\\_typology\\_of\\_repositories](http://www.ukoln.ac.uk/repositories/digirep/index/Themes#Ecology_and_typology_of_repositories)

<sup>22</sup> For a Flash demo which shows how this diagram can be used, see: <http://www.rubric.edu.au/extrfiles/wheel/main.swf>



**Figure 3. Cosmic View of Repositories (McLean, 2004)**

This "cosmic" view was simplified for use in describing repositories of teaching materials by the JISC's WM-Share<sup>23</sup> LOR project, shown below in *Figure 4*. This approach further identified some useful ways of mapping characteristics of LOR developments.

<sup>23</sup> <http://www2.worc.ac.uk/wm-share/>





**Figure 4: Models: Teaching Content Repositories (Thomas, 2005)**

Another approach is to distinguish different types of repositories by consideration of the services around them (Nicol, 2004). There is useful work going on in this area in the JISC/DEST eFramework project<sup>24</sup>. However, the eFramework focuses on the implementation of different technologies, and while CD-LOR will feed into this work where appropriate, it is not the main focus of the project.

A further perspective investigated by CD-LOR is that use of LORs can be viewed as positioned along a continuum of interaction ranging from passive sourcing of information objects, e.g. where the user downloads articles from a repository, to active creation, sharing, and management of resources and even sharing ideas and practice about the use of the resources, e.g. where the user creates, stores, and manages his/her own resources, or where groups of users collaboratively generate, share and reuse resources. However, in any given LOR, any given user may be placed at different places along this continuum at different times; given that all of the CD-LOR partners are providing at the very minimum an LOR that allows passive sourcing and accessing of resources, and all are wanting to develop a learning community around their LOR that will in some way utilise the repository further along the active end of this continuum, it is perhaps not a useful dimension for CD-LOR to focus on.

With the above-mentioned typology/dimension ideas in mind, CD-LOR collated a list of dimensions or characteristics of repository developments felt to be of use in looking at learning communities, based on the range of LORs described in the literature, and those under investigation by CD-LOR:

1. Purpose, e.g. types of resources exchanged (sound files, lecture notes, modules); preservation of materials; sharing of resources; central management of IPR

<sup>24</sup> JISC/DEST eFramework for Education and Research: <http://www.e-framework.org/>

2. Subject area or discipline
3. Scope, i.e. departmental, institutional, regional, national, or international
4. Educational sector, i.e. school, higher education, further education, lifelong learning, etc.
5. Contributors, e.g. teachers, students, publishers, institutions (through support staff), projects (through managers)
6. Business model, i.e. business, trading and management framework underpinning repository.

These dimensions are described more fully below:

### 1. Purpose

A variety of drivers might lie behind the development of LORs. Heery and Anderson (2005) suggest primary functionalities might include enhanced access to resources, preservation of resources, institutional asset management, sharing and reuse of resources (p. 14). A. Thomas (personal communication, December 9, 2005) suggests other purposes might include building a community and provision of service to institutions. LORs may also differ in terms of the types of resources they contain – such as digital assets (e.g. images, sound files), information resources, learning activities, learning designs.

### 2. Subject area or discipline

Repositories may be targeted at specific disciplines (e.g. SIESWE Learning Exchange focuses on social work). Research has shown that subject area, along with the pedagogic approach, are among the major variables that can impact the potential for sharing and reuse of LOs (Collis, 1995). For example, Russell (2005), describing findings of a study looking at disciplinary patterns of technology adoption at University of New South Wales in Australia, notes that “discipline differences appeared to be potential barrier to the building of new communities of practice around educational technology...” (p. 64). Some disciplines may be more successful than others in reuse. Patterns of technology use may vary across different disciplines (Cook, 2006). Disciplines may differ in terms of the key curriculum outcomes and preferred pedagogic approaches (HEA, 2006). Subsequently, types of resources different discipline communities are likely to want to reuse may vary (Masterman & Lee, 2005). It may be questioned whether this has to do with the skills/existing practices in information and knowledge management, or because of a particular culture of collaboration within that discipline, or for other reasons.

### 3. Scope

LORs can cover communities ranging from intra-institutional, institutional and regional to national and international. Communities may find it useful to share some resources with colleagues or learners locally (i.e. within institutional or classroom-based communities), while they may wish to share other resources more widely (nationally or internationally). The geographic coverage may have implications for the coherence of communities and the ways the members communicate and interact.

### 4. Educational sector

LORs may also target a range of educational sectors – e.g. school, higher education, further and vocational education. Different educational sectors are likely to have different needs in terms of the scope and granularity of LOs. For example, the school and further education sectors are based around standardised curricula. Therefore teachers from these sectors may be more likely to reuse ‘larger’/aggregated sections of material that are based on a number of learning outcomes (Littlejohn, Jung, & Broumley, 2003).

### 5. Contributor

LORs can differ in terms of a range of contributors and their roles. For example, in the CANDLE project, an international collaboration between a number of institutions in sharing LOs, 12 actors who could potentially be involved in creating/assembling/using LOs were identified and grouped into 5 categories (Scott & van Helvert, 2001):

- content experts
- teachers/tutors



- learners
- support staff assisting actors 1-3 above
- managers

The roles these contributors can fulfil in terms of LORs are different. Content experts may be subject-matter experts designated to create LOs, or they may be the teachers/instructors themselves (in a higher education context the teachers are usually the content experts). Content experts may or may not have knowledge or skills around pedagogy and pedagogic design, which can be a critical factor in terms of LOR utilisation. Support staff can include designers who create or assemble LOs; technical support staff who create and format the LORs; cataloguers who create or edit metadata for LOs; or librarians who are responsible for general management of LOs. Managers are the policy makers whose role in uptake and use of LOs can be critical in that they are the ones who make the strategic decisions about reuse policies, procedures, staff, finance, and infrastructure, copyright and intellectual property policies, rights and privileges, etc. Librarians may also sometimes act in managerial roles. Finally, learners are the end-users, but who can also jointly create LOs with their peers or teachers. A major issue is their skills in appraisal of quality and relevance of the resources that they find, reuse or create. Disciplinary, institutional and cultural contexts within which this category of contributors operate will differ in terms of tolerance for learners selecting or creating their own resources.

## 6. Business model

LORs could differ in terms of the underlying business and trading models, as well as the range of micro-economic and macro-organisational aspects (P. Sloep, personal communication, 16 February 2006). These issues include risk analysis and management; governance (for example for multi-institutional LORs); financial aspects such as funding, auditing, accounting, financial models; added value for the stakeholder and user communities; legal issues. This dimension could be relevant for communities particularly in formative phases of a repository, particularly if it involves multi-institutional collaboration (L. Malek, personal communication, 21 January 2006).

### **2.5.5.1 A two-dimensional approach?**

Once the above six dimensions had been developed, CD-LOR attempted to simplify the issues as a starting point by looking at a two-dimensional approach, examining subject area/discipline against scope (institutional to cross-institutional). Any LOR could be mapped to one of the four quadrants suggested by this approach; in each quadrant a series of questions could be asked to elicit the similarities of LOR developments within that quadrant and to contrast them with developments in other quadrants. However, after much discussion amongst the team and the Steering Group, this approach was felt to be too simple, and was put to one side, although a number of partners and Steering Group members found it to be a valuable exercise for sparking discussion; for this reason the discussion paper presenting this approach is given in *Appendix 1*. The questions to be asked concerning the LORs in each quadrant were taken forward for use as the beginnings of a structure for *Deliverable 9: Structured Guidelines*.

While the six dimensions described above relate to communities in the sense that they draw out important aspects of the context within which the LORs and communities operate, it was noted that CD-LOR was still not really homing in on dimensions of communities as described in the social sciences. Further work was needed.

### **2.5.5.2 Community dimensions revisited**

What are the key dimensions of communities? A few frameworks have been suggested in the literature.

#### **Seufert, Moisseeva & Steinbeck's 5 community dimensions**

Seufert, Moisseeva, and Steinbeck (2001b) define communities along the following five dimensions:

1. Purpose, i.e. a shared goal or activity that provides the primary reason for belonging to the community;
2. Affiliation, i.e. voluntary, self-selected, intrinsic motivation;

3. Relationship, i.e. emotional connection among community members built on trust;
4. Coherence, i.e. common interest in a topic, informal discourses and shared experiences and discussions; and
5. Lifespan, which depends on the duration of the common interest.

### **AERS Project: seven possible community dimensions**

C. Sinclair (personal communication, January 17, 2006) informally reported to CD-LOR on a framework currently being developed within the *Frameworks for fostering and evaluating communities of enquiry in the field of learning and teaching* strand of the Applied Educational Research Scheme (AERS) project.<sup>25</sup> She suggested the communities might be defined along the following seven dimensions:

1. Participation/dialogue
2. Relationships
3. Perspectives
4. Context
5. Climate
6. Purpose
7. Control

She emphasises that the first dimension, which relates to the ways in which community members participate in the community and how dialogues and other forms of discourse take place, might be particularly significant in terms of how they use the LORs.

### **Koper, Rusman & Sloep's community dimensions**

The following framework has been proposed by Koper, Rusman, & Sloep (2005). It includes three key sets of dimensions:

1. Social space
  - 1.1. Affective relationships
  - 1.2. Cohesiveness
  - 1.3. Trust
  - 1.4. Respect
  - 1.5. Belonging
  - 1.6. Satisfaction
2. Community member characteristics
  - 2.1. Experience within communities (veterans vs. newbies)
  - 2.2. Trendsetters (connectors, mavens, salesmen)
  - 2.3. Lurkers vs. posters
3. Community characteristics:
  - 3.1. Boundaries
  - 3.2. Rules
  - 3.3. Monitoring possibilities
  - 3.4. Sanctioning mechanisms

### **CD-LOR's proposed dimensions**

For the CD-LOR project's purposes, the following key dimensions of communities have been synthesised from the above frameworks:

1. *Purpose* – this is the shared goal/interest of the community; the reason why the community was formed in the first place
2. *Dialogue* – modes of participation and communication (online, face2face or mixed)
3. *Roles and responsibilities*
4. *Coherence* – i.e. whether the community is close-knit or loosely confederated/ transient
5. *Context* – the broader ecology within which the community exists (e.g. institutions, organisations, professional bodies, governments, etc.)

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<sup>25</sup> [http://www.aers.ac.uk/aers/llt\\_1.html](http://www.aers.ac.uk/aers/llt_1.html)

6. *Rules* – implicit and explicit rules that govern the functioning of community (e.g. ground rules of conduct, rewards and incentives mechanisms, control of access and use of resources, etc.)

Because CD-LOR is looking specifically at communities based around teaching and learning, and because it has been noted above that pedagogical approach may be important in defining how a given LOR may be used, this was added as a seventh community dimension:

7. *Pedagogical approach* – how those participating in this community go about their teaching and learning (e.g. if their courses focussed around problem-based learning there may be a need to find problem scenarios and case studies and to share group activities around these; if students are required to produce collaborative work, will it be useful for them to share the results via the repository?, etc.).

How these dimensions relate to the repository dimensions noted in the first part of this section is still under investigation; it is likely that the original six dimensions will be able to be folded into these seven community dimensions, perhaps as aspects of 5. *Context* and 6. *Rules*. Questions for LOR developers and curators to ask themselves for both sets of dimensions are given in *Section 4. Conclusions* as the beginnings of a structure for *Deliverable 9: Structured Guidelines*.

### 3. Linking LORs, communities, issues, solutions: An initial mapping

This section reports on the results of CD-LOR's initial stakeholder consultation, where existing LORs were mapped against the barriers, enablers and dimensions discussed in *Section 2*.

#### 3.1 Community and repository dimensions of CD-LOR's partners

CD-LOR is working with a number of Associate and Collaborative Partners<sup>26</sup>. The Associate Partners all have LORs in various stages of development in support of a wide range of community types. They will provide test-beds for CD-LOR's work involving real learning communities. The project is also working in a variety of ways with a number of Collaborative Partners. In some cases CD-LOR will be testing and evaluating some of the Associates' solutions to barriers to repository use with Collaborative Partners also.

CD-LOR's Associate Partners are: Edinburgh University LORE, UHI Millennium Institute, Aberdeen University, University of Ireland Galway (both their institutional repository and the national Irish LOR NDLR that they are working with), SIESWE Learning Exchange (formerly Stòr Cùram), Jorum, IVIMEDS, and Spoken Word Services (for a brief overview of these repositories see *Appendix 2*). These repositories have been analysed initially in terms of eight key aspects—particularly their purpose, expected users, the types of resources shared, scope of use, target discipline covered, roles (resource creators, users, facilitators), and the context of use. Throughout the project, these aspects then evolved into the six dimensions outlined above on pp. 20-21 (but not the community dimensions). The findings from an initial scoping of these LORs are summarised in *Table 2*:

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<sup>26</sup> See: [www.ic-learning.dundee.ac.uk/projects/CD-LOR/index\\_files/partners.htm](http://www.ic-learning.dundee.ac.uk/projects/CD-LOR/index_files/partners.htm); see also *Appendix 2* for a brief summary of each Associate Partner.

Table 2. CD-LOR Associate LORs and their (potential) user communities

LOR	Purpose	Expected users	Resource types	Scope	Disciplines covered	Sector	Organisation of communities	Resource creators
<b>1. Edinburgh University LORE</b>	To investigate the need for, and gather the learning and teaching materials of the University of Edinburgh	University of Edinburgh staff	Mostly single documents (word, PDF), lecture notes (PowerPoint), small number of interactive java applets, web pages (html)	Institutional	All three Colleges at the University of Edinburgh	HE	Not clear at the current stage	University staff
<b>2. UHI Millennium Institute</b>	To share learning materials for UHI courses between academics (not students)	Academics at UHI Millennium Insitute	A wide range of resources in LO format	Institutional	Multi-disciplinary	HE	None at the moment – self organising	Internal and external
<b>3. Aberdeen University</b>	<ul style="list-style-type: none"> <li>- To facilitate re-use and sharing of content, design, and good practice in e-learning;</li> <li>- To archive/escrow old (mostly learning technology) applications, content, and objects;</li> <li>- To investigate cross-over functionality with the online image databases/repositories &amp; digital curation</li> </ul>	Learning technologists, IT training & documentation team, lecturers, museum curators	Not a lot as yet. Will be populated with generic web references, WebCT content packages, CAA questions, bespoke Flash objects and applications, audio, images, video etc.	Institutional	Multi-disciplinary	HE	Not clear at the current stage	Learning technologists & academic staff
<b>4.1. University of Ireland Galway Institutional LOR</b>	To maintain & collate locally produced multimedia learning materials, documentation and training programmes	CELT staff and local academics	A wide range of resources	Institutional	Multi-disciplinary	HE	Not decided yet	Any participant
<b>4.2. University of Ireland Galway National LOR</b>	To share collections of digital learning materials across Irish HE	Academic staff from across Ireland	A wide range of resources	National; currently negotiating memoranda of understanding & sharing relationships with other countries	Multi-disciplinary	HE	On subject network basis as part of a government funded project	Any participant

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<b>5. SIESWE Learning Exchange</b>	To support & enhance the learning of people involved in social work and social care education through the provision and development of a repository of digital learning materials	Within 3 years: Scottish social work educators in HEIs (in 2005), FE colleges (2006) & social work agencies (2007) and learners involved in social care education at all stages of learning	Digital learning resources or learning objects (e.g. explaining a single concept or describing a single learning activity), of many different types, from a text-based handout describing a learning activity, to a multi-media interactive case-study. The repository catalogues resources on the open Internet, some of which are at a larger level of aggregation	Scottish and subject specific. Currently in discussion with colleagues – nationally & internationally, incl. Canada, NL and NZ - about possible content sharing	Single-discipline (social work)	HE, FE, postqualifying	None at this stage; planning to facilitate community building with F2F & online communication	<ul style="list-style-type: none"> <li>- In-house team</li> <li>- Repurposed from existing resources</li> <li>- Licensed from 3rd parties</li> <li>- Catalogued from www</li> </ul>
<b>6. Jorum</b>	To collect & share l & t materials, allowing their reuse and repurposing. Also, this repository service will form a key part of the JISC Information Environment	Teaching & support staff in the UK FE/HE. Not currently accessible to students directly	Any, from single files, e.g. images, documents etc., to IMS content or SCORM packages, max. 11Mb per object (with some flexibility).	National	Interdisciplinary  Note: Material will be subject-classified according to the LearnDirect and JACS schemes.	FE & HE	<p><i>Contributors</i> will upload content, attach metadata, classify &amp; publish resources. Contributors can simply upload content &amp; attach minimal metadata; funded RDN cataloguers then complete the workflow. <i>Users</i> will be able to browse, search, preview, export &amp; repurpose resources.</p> <p><i>Contributors</i> include:</p> <ul style="list-style-type: none"> <li>- self-organised projects/institutions who approach Jorum with materials;</li> <li>- centrally- funded projects, as a condition of their funding</li> <li>- institutions may sign up to one or both Contributor and User services</li> </ul>	Teaching and support staff. 3 <sup>rd</sup> party material can be submitted if a permission to do so is secured. Individually-owned content is not accepted, given the legal issues.

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<b>7. IVIMEDS</b>	To enable partner institutions to share learning resources with a view to making medical education more effective & efficient through the application of new learning technologies.	Partner medical schools. Later the resources will be made available to other medical schools, institutions & individuals with an interest in medical education.	From single frames to a series of frames and modules on a topic, including diagrams & animated sequences with/without sound commentaries, clinical illustrations, patients and their investigations and video clips.	International	Range of disciplines within medicine	Current: undergraduate HE; future: postgraduate / continuing medical education	Through the International Virtual Medical School (IVIMEDS) collaboration with the Board of Directors and a Steering Council in which all partner schools are represented	Partner schools & IVIMEDS core team; also sourced from publishers and www
<b>8. Spoken Word Services<sup>27</sup></b>	To enhance and transform educational experience through the integration of digitised spoken word audio into learning and teaching.	Teachers and students in undergraduate education in the US and UK	Digital audio with associated text and images	International	Multidisciplinary	HE	Users are encouraged to develop different ways of working with the resources. Students may be requested to listen to the audio file, having been directed beforehand to listen out for mention of specific topics, or answers to specific questions. Resources relating to the audio material will be supplied, and may be accessed before or after the student has heard the material.. Students will share their comments, queries and reflections on the audio material via online discussions or other interactive features.	Project staff; resources are then evaluated by subject-matter experts

<sup>27</sup> Spoken Word Services did not take part in the initial scoping, The data in this table is taken from their website <http://www.spokenword.ac.uk/index.php>

### **3.2 Barriers and solutions: An initial investigation of CD-LOR's partners**

Thus far, this report has proposed a typology of learning communities, in the form of key dimensions, and outlined a number of barriers to utilisation of LORs by communities. Are there barriers and solutions particular to specific community types or dimensions?

In order to begin exploring this question, a workshop involving a number of CD-LOR project partners took place in October 2005 (Margaryan, 2005). The goal of the workshop was to investigate the key issues in the use of LORs from the perspective of the curators of these LORs, as well as to elicit their feedback on the proposed typology of learning communities. Another goal was to begin mapping the issues against types of communities, as well as identify potential and tested solutions to these issues. The following Associate/Collaborative Partners participated in the workshop: Aberdeen University, Edinburgh University LORE, SIESWE Learning Exchange, University of Ireland Galway, UHI Millennium Institute, Jorum, Spoken Word Services, DIDET, and the WM-Share project.

A range of barriers to utilisation of LORs were reported by the partners (Margaryan, Littlejohn, Nicol, 2006; see also *Appendix 3* for a simplified version of this data presented by Littlejohn, 2005). These issues fall into the four categories identified in *Section 2.3*: socio-cultural, pedagogical, organisational/information management, and technological. They are summarised below.

#### Cultural issues:

DIDET highlighted a mismatch in understanding between the developers and the users of the LOR. This stresses the importance of linking the development of LORs to the needs of specific user communities. Communities should be understood on different levels: in terms of the culture of the organisations within which these communities operate; in terms of the disciplinary and educational sector cultural norms and expectations, as well as in terms of the national cultures represented within the communities (DIDET is a UK/US collaboration). This leads to:

#### **Issue 1. Design of LORs currently not based on clear understanding of user communities**

Two other repositories - SIESWE Learning Exchange and Jorum - identified cultural issues associated with sharing resources and collaboration across a range of institutions. However, it is not clear whether these are in effect cultural or organisational issues.

#### Organisational/information management issues:

SIESWE Learning Exchange emphasised the tension between the drive to collaborate across institutions within a discipline and a tendency for institutions to feel competitive, the latter being largely related to the culture and identity of a particular institution. They also noted a lack of good technology support in some institutions. In addition, they highlighted issues more loosely aligned with the disciplinary context including users' technology skills. Jorum highlighted the critical mass and quality of the resources, as well as issues related to user skills and motivation such as a need for user training and support nationally and the costs associated with such support. Information management issues from DIDET's perspective included users' lack of skills in organising and categorising information, which suggested a need for information literacy training, and longer-term support in the use of the LOR. Two common issues surfaced:

#### **Issue 2. Users lack technology and information literacy skills**

#### **Issue 3. Lack of incentives and rewards to motivate communities to use the LORs**

#### Pedagogic issues:

As a classroom-based LOR, some of the issues highlighted by curators of DIDET focused on the need for classroom-based learning models to change in order to accommodate and encourage the sharing of student-generated resources. Furthermore, the requirement for LOs to be de-contextualised to promote maximum reusability was a major concern. In addition, the

educational narrative within the metadata associated with these LOs did not provide the rich quality of information required for effective learning. This leads to the following two issues:

**Issue 4. Pedagogic model involving co-construction of resources by the students**

**Issue 5. Need for rich educational metadata**

Technological issues:

A range of technological issues were highlighted, most of which were in congruence with the issues identified in the literature. Usability and authentication-related issues were often mentioned. This leads to:

**Issue 6. Lack of usability and utility of tools, processes, and standards for metatagging, search, retrieval, authentication, and workflows**

All issues per LOR dimension identified by the participants are summarised in *Table 3*:

**Table 3. Core categories of issues per LOR dimension, participants' perspective**

LOR dimensions	Core categories of issues
<b>1. Scope</b>	
1.1. Institutional	<ul style="list-style-type: none"> <li>• Culture clash</li> <li>• Lack of institutional strategy</li> <li>• Connection with institutional VLE</li> <li>• History of ICT use</li> </ul>
1.2. National	<ul style="list-style-type: none"> <li>• Culture clash</li> <li>• Critical mass</li> <li>• Connection with institutional repository</li> <li>• Managing multiple partners</li> </ul>
1.3. International	<ul style="list-style-type: none"> <li>• Culture clash</li> <li>• IPR</li> </ul>
1.4. Regional	<ul style="list-style-type: none"> <li>• Clarity of purpose</li> <li>• Sustainability</li> <li>• Connections with existing VLEs</li> </ul>
<b>2. Educational sector</b>	
2.1. Higher Education	<ul style="list-style-type: none"> <li>• Focus on teaching vs. learning</li> <li>• Focus on content delivery</li> <li>• Non-standard curriculum</li> <li>• Teaching culture (lack of sharing)</li> <li>• Technology (lack of)</li> </ul>
2.2. Further Education	<ul style="list-style-type: none"> <li>• Culture (lack of sharing)</li> </ul>
2.3. School	<ul style="list-style-type: none"> <li>• Culture (lack of sharing)</li> </ul>
<b>3. Disciplinary</b>	<ul style="list-style-type: none"> <li>• Language</li> <li>• Teaching style diversity</li> <li>• Specific types of resources</li> <li>• Diversity of CoPs within disciplines</li> <li>• Different user IT skills</li> </ul>
<b>4. Contributors</b>	<ul style="list-style-type: none"> <li>• Culture of sharing (lack of)</li> <li>• Motivation</li> </ul>



	<ul style="list-style-type: none"> <li>• Ownership</li> <li>• Authenticity and quality of student-created resources</li> <li>• Common language</li> <li>• IPR (understanding of)</li> <li>• Users' skills in info management</li> </ul>
<b>5. Purpose and types of resources shared</b>	<ul style="list-style-type: none"> <li>• Quality of resources</li> <li>• Metadata</li> </ul>

In addition, a number of generic factors that could impact the implementation of the LORs were identified by the workshop participants, many of which are in congruence with ideas being discussed in the literature. These included metadata management and quality; lack of resources for long-term management and maintenance of LORs; contradictions between organisational drivers and personal motivations of the users; cultural mismatches at the organisational level and between the different stakeholders within the communities (for example LOR developers, librarians, users and the management).

Furthermore, the workshop participants proposed solutions to some of the issues. These are summarised in *Table 4*:

**Table 4. Solutions for some core categories of issues, participants' perspective (Margaryan, 2005)**

<b>LOR dimensions / sub-dimensions</b>	<b>Core categories of issues</b>	<b>Solutions</b>
<b>1. Scope</b>		
1.1. Institutional	Connection with institutional VLE	<ul style="list-style-type: none"> <li>• Ensuring educational usability</li> <li>• Improvement of technical and human interoperability</li> <li>• Training for institutional change</li> </ul>
1.2. National	<ul style="list-style-type: none"> <li>• Culture clash</li> <li>• Critical mass</li> </ul>	<ul style="list-style-type: none"> <li>• Different interfaces for different user groups</li> <li>• Starter packs</li> <li>• Early users commit to uploading resources upfront</li> <li>• Making it easy to move objects between LORs</li> <li>• Provide federated search</li> </ul>
1.3. International	IPR	<ul style="list-style-type: none"> <li>• Clear policy</li> <li>• Systematic procedures</li> <li>• Standard license</li> </ul>
<b>2. Educational sector</b>		
2.1. Higher Education	Teaching culture (lack of sharing)	<ul style="list-style-type: none"> <li>• Clearer copyright</li> <li>• Simple rules/guidelines</li> <li>• Incentives</li> <li>• Specified in employment contracts</li> <li>• Identify and work with early adopters</li> </ul>
<b>3. Disciplinary</b>	Diversity of communities within	<ul style="list-style-type: none"> <li>• Don't fight it - offer flexibility</li> </ul>

	disciplines	<ul style="list-style-type: none"> <li>• Don't fight it – focus on disciplines willing to contribute</li> </ul>
	<b>Generic issues</b>	
	<ul style="list-style-type: none"> <li>• Purpose (LORs driven externally rather than by users' needs)</li> <li>• Staff workload</li> <li>• User motivation</li> <li>• User skills</li> </ul>	<ul style="list-style-type: none"> <li>• Develop solutions based on users' practice</li> <li>• Create added value</li> <li>• Employ dedicated staff</li> <li>• Evaluate workload and develop workflows to support</li> <li>• Academic recognition</li> <li>• Bonus for staff/funding for department</li> <li>• Created added value for sharing</li> <li>• Users/staff have to recognise this as a problem</li> </ul>

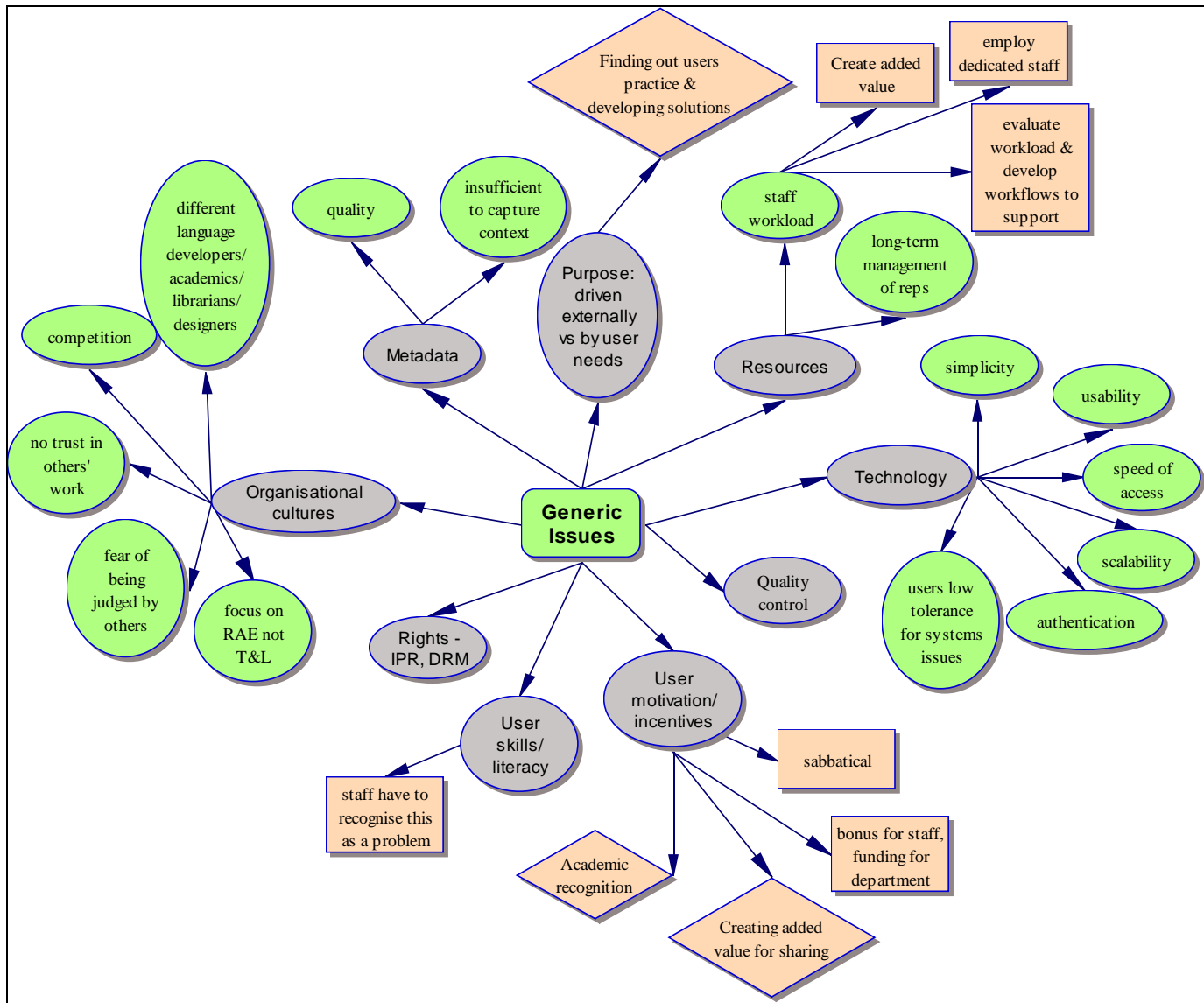
Finally, participants were asked to prioritise two solutions each. The following solutions were prioritised:

1. Standardised IPR licences
2. Academic recognition
3. Incentives, particularly creating added value for uploading/sharing resources
4. Developing solutions based on users' current practice
5. IPR – applying a systematic approach

Based on the analysis of the data collected during the workshop, the key categories of issues and solutions were mapped onto the LOR dimensions. This map is shown in *Figure 5*:



Generic issues and solutions were mapped separately (Figure 6 below):



**Figure 6. Generic issues in utilisation of LORs**

This is only an initial attempt at mapping out the terrain of LORs and communities. More research is needed into the actual communities that these LORs are aiming to serve. In particular, more insight is needed in order to map the communities in terms of the proposed dimensions. The factors identified during the workshop are fairly generic. Therefore they are an insufficient basis for development of solutions and recommendations. This requires collection of detailed data from all stakeholders within the LORs, specifically the actual users and potential users. To achieve this, CDLOR is planning to carry out user interviews and a survey to feed into *Deliverable 7: Report on institutional and personal knowledge management review*. These investigations, alongside the development, testing and evaluation of partners' solution use cases, will help to better understand the communities and their needs.

## 4. Conclusions: the beginnings of the structured guidelines

Some general conclusions may be drawn from the work carried out by CD-LOR to date. A number of key challenges for the future development of LORs are outlined here:

- LOR models should shift from delivery of LOs to supporting teaching and learning processes within communities in more explicit ways.
- LORs should be more closely linked to institutional and national strategies for teaching and learning.
- Design of LORs should be based on needs of the communities and potential users.
- User needs are best integrated through cascading or collaborative approaches to design and development such as rapid prototyping or formative/developmental research, in which development and implementation occur concurrently and involve consultation with the representatives of the target group of users at all stages of the project.
- Recognition and rewards should be used to encourage the wider adoption of LORs. Rather than adopting generic approaches, methods of recognition and reward should be based on understanding of the user communities and what could motivate them.
- Mechanisms for quality assurance of resources must be developed/further improved, particularly in LOR models involving student-contributed resources.
- More work is needed in realising interoperability of LORs and their linkage with personal resource management tools and strategies, as well as wider institutional information environment, tools and systems. It must be ensured that these systems work together to support learning within communities.
- User information literacy and development is an important factor in implementation of LORs. Such efforts should include wider institutional community development.

The part that this report can play in meeting some of these challenges is in forming a basis for the project's future outputs (as noted in *Section 1*). To this end, integrating the findings from the literature review (*Section 2*) and the stakeholder consultation (*Section 3*), a list of key questions has been derived, which form the starting point for developing *Deliverable 9: Structured Guidelines*. These guidelines will provide assistance to those developing or evaluating LORs. It is anticipated that each question will be further refined and perhaps broken down into sub-questions, with issues to consider, suggestions, ideas and resources provided for each based on CD-LOR's findings, depending on the answers given.

1. What is the purpose of the repository? (e.g., what kinds of learning resources will be stored in the repository and why?)
2. Who are the key stakeholders of that community? Of these, who will contribute to/use resources within the repository?
3. What business model will be used in the operation of this repository?
4. What is the purpose (shared goal) of the community or communities that the repository will help facilitate?
5. What are the modes of participation and communication in that community?
6. What are the roles and responsibilities of those involved in the community?
7. How coherent is the community?
8. What is the broader context within which the community operates?
  - a. What subject(s) or discipline(s) will the repository serve?
  - b. What is the scope of the stakeholder community the repository will serve? (e.g. departmental, institutional, national?; HE, FE, both?)
9. What are the implicit and explicit rules that govern the functioning of that community? (e.g. rules of conduct, rewards and incentives, control of access, workflows, etc.)
10. What pedagogical approaches are in use within the community?

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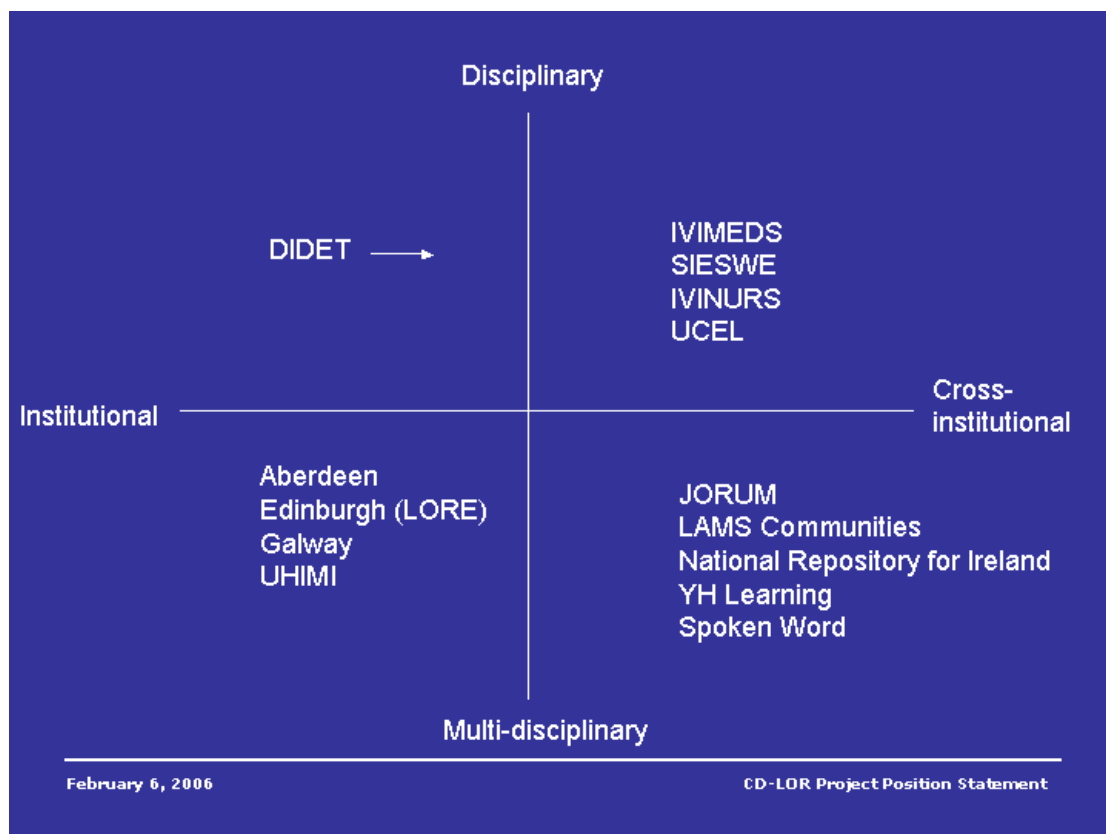
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## Appendix 1. A Two-Dimensional Framework for Discussion (Paper for the CD-LOR Steering Group/Partners' Meeting, February 6<sup>th</sup>, 2006)

A framework for addressing repository issues was proposed for discussion at the CD-LOR Steering Group / Partners' Meeting. The general consensus of the meeting was that it was felt to be useful as a discussion tool, and that it may be a useful basis for beginning to investigate dimensions of repositories, particularly perhaps in building on McLean & Blinco's Wheel of Fortune (McLean, 2004). However, it was decided that in terms of feeding into a framework for the CD-LOR Project, the questions used within the two-dimensional matrix would be the most useful aspect to take forward, used in conjunction with the community dimensions synthesized within the main report (see *Section 2.5.5*).

The framework comprises a simple two-dimensional matrix resulting in four quadrants (see *Figure 7* below). The dimensions are disciplinary---multi-disciplinary and institutional---cross-institutional. Repositories are located within the quadrants, although movement to another quadrant is possible (e.g. DIDET<sup>28</sup>, one of CD-LOR's Collaborative Partners, is currently an institutional repository in engineering, but there is discussion about developing a joint repository across Strathclyde and Stanford universities). The social, organisational and business issues are then addressed within each quadrant separately in order to tease out whether there are common factors within each quadrant. The thinking behind this framework is discussed below.



**Figure 7. Dimensions from literature review (issue areas)**

<sup>28</sup> <http://dmem1.ds.strath.ac.uk/didet/>

Issues derived from CD-LOR's literature review may be related to each quadrant. Common issues are:

- Purpose of repository
- Types of learning objects in repository
- Contributors/users of repository (roles, responsibilities)
- Business model underpinning repository (trading framework, management of repository etc)
- Social/community dimensions
- Support for learning
- Embedding institutionally
- National policies

### **Example questions based on above issues (under development)**

The issues might be turned into questions that serve as a checklist for stakeholders to use when evaluating a repository in use or evaluating how to support an existing repository or develop a new repository, e.g.:

- What is the purpose of the repository?
- What kinds of learning resources are appropriate for the repository?
- Who should contribute to/use resources within the repository?
- What business (trading) model is appropriate for the operation of this repository?
- How should we facilitate communities of contributors/users around the repository?
- How can the repository be used to support teaching and learning?
- How will use of the repository be embedded institutionally?
- What national policies would support repository use in education?

### **Potential answers to the above questions in relation to each quadrant**

This section shows changes in the issues (some more than others) as we move from quadrant to quadrant and in ways of addressing those issues.

#### **QUADRANT 1 (Institutional / Disciplinary: DIDET etc.)**

*Purpose* - share and reuse disciplinary learning resources within an institution, develop information-literacy, improve classroom learning etc.

*Resource types* – student-created resources developed while learning, specific to classroom context, teacher resources, links to external resources, links to external repositories

*Contributors* - students and staff and learning technologists

*Business model* – trading model not applicable but commitment from academic staff necessary, incentives might be required at departmental level to get all staff to participate

*Communities* – tight-knit, classroom facilitation important, integration of LOR use in course, small group learning

*Support learning* – wide range of resources, learning task design critical, different pedagogies possible although focus in DIDET on social constructivist pedagogies

*Embedding institutionally* – technical support, integration with other systems (e.g. VLE), financial sustainability must be addressed.

*National policies* – exemplars of use, links of disciplinary institutional repositories to external national repositories will raise further issues

QUADRANT 2. (Cross-institutional / Disciplinary: IVIMEDS etc.)

*Purpose* - share and reuse disciplinary learning resources across institutions

*Resource types* – relevant to specific curricula/programmes

*Contributors* – currently recognised experts, teachers, commissioned resource creators

*Business model* – suggests a trading model – e.g. tokens, barter, royalties, payments; some believe altruism might work given the tight-knit nature of some of these communities (e.g. medical educators and practitioners), consortium agreement

*Communities* – tight-knit but competition between institutions, communities of practice exist, involve professional institutions, build on natural affiliations/interests (e.g. publications, events), employ disciplinary facilitators to publicise resources, recommender systems etc.

*Support learning* – wider range of resources, sharing of expertise.

*Embedding institutionally* – institutional partnerships with repository hosts, assured quality of resources, resources to repurpose

*National policies* – HEA subject centres support, link to RDN subject hubs and other disciplinary resources.

QUADRANT 3 (Institutional / Multi-disciplinary: ABERDEEN etc.)

*Purpose* - share and reuse learning resources across single institution, preserve knowledge assets, foster intra-institutional collaboration and integration

*Resource types* – relevant to all disciplines and programmes

*Contributors* – all teaching staff, support staff, collaborations

*Business model* – trading model less critical than institutional commitment with rewards and incentives to participate at institutional level

*Communities* – many and mixed types of communities (shared interests in teaching, friendship, hobbies), facilitate cross-institutional interest groups, LOR-champions, etc.

*Support learning* – encourage use of interdisciplinary conceptual frameworks, learn from methods used in other disciplines (learning designs)

*Embedding institutionally* – institutional strategies including links to promotion and reward, link research repository and LO repositories

*National policies* – Funding Council incentives to preserve assets, interdisciplinary learning

QUADRANT 4 (Cross-institutional / Multi-disciplinary: JORUM etc.)

*Purpose* - share and reuse learning resources from any discipline across many educational sectors (e.g. FE, HE)

*Resource types* – all possible resource types

*Contributors* – anyone can contribute

*Business model* – trading model critical, incentives possibly financial within and across disciplines, requires separate organisation (e.g. JISC) or consortium to manage LOR, workflow, DRM

*Communities* – multiple communities, require facilitation (e.g. one model might be CETIS SIG type facilitator), currently supply-demand issues

*Support learning* – distant from learning culture of institutions, depends on types of resources created and used

*Embedding institutionally* – Institutional use of national repositories dependent on perceived value, critical mass of LOs, quality assurance, exemplars, usability, DRM

*National policies* – reward institutions for contributing, support staff development for those contributing and reusing, link to national ICT policies.

## Some Comments on the Framework

Although there are common LOR issues as implied by the common questions in the quadrants, the practicalities of addressing these issues change as we move from one quadrant to the next. Indeed, it might be argued that the issues become more complex as we move from one quadrant to the next (e.g. from institutional/disciplinary to cross-institutional/multi-disciplinary).

It can be argued that the two dimensional framework is simplistic and the dimensions are an arbitrary selection. Two points are important to consider in responding to this argument:

Firstly, it appears to be helpful in unpacking some of the complexity we are faced if we locate different repositories in different quadrants; this in itself shows that this conceptual framework has some merit. Other dimensions as identified in the draft report (e.g. communities and contributors) do not easily help one make sense of the vast range of inter-related issues.

Secondly, this framework allows us to move from the *concrete* (reality of repositories that exist) to the *abstract* set of issues that underpin the management, organisation and use of these repositories to support teaching and learning. Having said this, further analysis might suggest that a matrix approach is more appropriate. Alternatively, the questions themselves might serve as the framework.

It is recognised that the questions posed for each quadrant must be refined through research with answers to these questions sought from current practice and from published accounts of LOR use. One outcome of this approach might be the construction of a toolkit of questions that different LOR stakeholders (institutional managers, teachers, support staff, JISC, national policymakers) might ask themselves together with information about how others have addressed these questions in practice; this in effect could be the basis of *Deliverable 9: Structured Guidelines*.

This framework and the way it has been presented does widen the scope of the Draft Report and possibly changes what might be important to the project. Can we really talk about community dimensions in isolation? Are they not inextricably linked to business models and institutional embedding issues?

## Appendix 2. Overview of CD-LOR Associate Partners

### **Edinburgh University LORE** <http://www.lore.ed.ac.uk/index.html>

The purpose of the repository is to investigate the need for, and gather the learning and teaching materials of the University of Edinburgh. The target users are University of Edinburgh staff. The repository is institutional in its scope, is aimed at Higher Education sector and covers all three Colleges at the University of Edinburgh. Contact: Sarah McConnell [sarah.mcconnell@ED.AC.UK](mailto:sarah.mcconnell@ED.AC.UK)

### **UHI Millennium Institute** <http://cms.uhi.ac.uk/index.jsp>

The purpose of the UHI repository is to share learning materials for UHI courses between academics (not students). The repository is institutional and interdisciplinary in its scope and is aimed at Higher Education sector. Contact: John Casey [john.casey@UHI.AC.UK](mailto:john.casey@UHI.AC.UK)

### **Aberdeen University** <http://suninfo.abdn.ac.uk:8080/intralibrary/index.jsp>

The purpose of the repository is to: (1) facilitate re-use and sharing of content, design, and good practice in e-learning; (2) archive old (mostly learning technology) applications, content, and objects; and (3) investigate cross-over functionality with internal online image databases/repositories and digital curation. The repository is institutional and interdisciplinary in scope and is aimed at learning technologists, IT training and documentation teams, lecturers, and museum curators. Contact: Dr. Colin Calder [colin.calder@ABDN.AC.UK](mailto:colin.calder@ABDN.AC.UK)

### **SIESWE Learning Exchange** <http://www.storcuram.ac.uk/>

The purpose of the repository is to support and enhance the learning of people involved in social work and social care education through the provision and development of a repository of digital learning materials. It is targeted at Scottish social work educators in HEIs, FE colleges and social work agencies as well as learners involved in social care education at all stages of learning (HE, FE, postqualifying). Contact: Neil Ballantyne [neil.ballantyne@STRATH.AC.UK](mailto:neil.ballantyne@STRATH.AC.UK)

### **Jorum** <http://www.jorum.ac.uk/>

Jorum is a collaborative venture in UK Further and Higher Education to collect and share learning and teaching materials, allowing their reuse and repurposing. Jorum is an interdisciplinary repository and is available to teaching and support staff in Further and Higher education institutions in the United Kingdom. It is not currently accessible to students directly or to any educational sector other than UK F/HE. Contact: Moira Massey [Moira.Massey@ED.AC.UK](mailto:Moira.Massey@ED.AC.UK)

### **IVIMEDS** <http://www.ivimeds.org/newshowcase/>

The purpose of the repository is to enable partner institutions to share learning resources with a view to making medical education more effective and efficient through the application of new learning technologies. The repository is international in scope. It covers a range of disciplines within medicine and is accessible to students directly. It targets mainly undergraduate medical education but there are plans to extend to postgraduate and continuing medical education. Contact: Prof. Ronald Harden [d.donald@GCAL.AC.UK](mailto:d.donald@GCAL.AC.UK)

### **University of Ireland Galway (institutional and national repositories)**

<http://celtserver.nuigalway.ie:8080/intralibrary> (by login only);

**national repository (National Digital Learning Repository (Ireland))**

<http://www.learningcontent.edu.ie/intralibrary/index.jsp> (by login only); **general info** <http://www.learningcontent.edu.ie/>

The University is currently involved in two repository projects: one on an institutional level and the other on a national level, in collaboration with HE institutions in the Republic of



Ireland, under the umbrella of the National Digital Learning Repository (NDLR) project. The purpose of the institutional repository is to maintain and collate locally produced multimedia learning materials, documentation and training programmes; the national repository's purpose is to share collections of digital learning materials across Irish HEIs. Both repositories are multidisciplinary and aimed at local academics as well as the academic staff from across Ireland. Contact: Dr. Iain MacLaren [ian.maclaren@NUIGALWAY.IE](mailto:ian.maclaren@NUIGALWAY.IE)

**Spoken Word Services** <http://www.spokenword.ac.uk/>

Spoken Word Services is a part of Learning Services at Glasgow Caledonian University. The aim of this repository is to pursue the transformation of undergraduate learning and teaching in the U.S. and Britain, through the integration of rich media resources of digital audio repositories into undergraduate courses. This international repository serves teachers and students within a range of disciplines in undergraduate education.

Contact: David Donald [d.donald@GCAL.AC.UK](mailto:d.donald@GCAL.AC.UK) or Iain Wallace [Iain.Wallace@gcal.ac.uk](mailto:Iain.Wallace@gcal.ac.uk)

## **Appendix 3. Mapping of LORs, dimensions, communities and barriers (Littlejohn, 2005)**

### **IVIMEDS**

Repository:

Diagrams and animated sequences, commentaries, clinical illustrations, virtual patients

Repository dimension(s):

Disciplinary - medicine

Geographic - international

Community:

Subject focused community that shares and integrates resources within a range of learning approaches. Community members involve teachers and learners of medicine in 26 countries

Issues:

Cohesion of the community

Mapping curriculum at an international level

### **Jorum**

Repository:

Wide range of resource types across all subject disciplines

Repository dimensions:

Geographic – national

Discipline - interdisciplinary

Community:

Loose community focused around sharing resources produced by funded initiatives higher education academics across the UK

Issues:

Connecting with academics in institutions

Conditions of use/IPR

### **LAMS Community**

Repository:

Collection of Learning Design sequences created by teachers

Repository dimensions:

Geographic – international

Purpose - learning designs

Community:

Users of LAMS sharing learning designs. Community focusing around an LMS system sharing ideas in teaching and learning practice

Issues:

Communicating good practice  
Versioning

**DIDET**

Repository:

Students given group project tasks. Resources sourced by learners and uploaded to shared workspace. Students construct concept maps to justify product design.

Repository dimensions:

Geographic - classroom  
Contributors – students and lecturers  
Discipline - engineering

Community:

Tightly knit, classroom based learning community engaged in shared tasks with agreed interaction. Users are product design students

Issues:

Information literacy skills  
Archiving informal resources

**LORE**

Repository:

Single documents (in word, pdf formats), lecture notes and powerpoint slides, some interactive java applets and web pages

Repository dimensions:

Geographic - institutional  
Disciplinary – multidisciplinary  
Educational sector – Higher Education

Community:

In pilot phase, hence no active user community yet; the LOR aims at the Edinburgh university staff

Issues:

(Potentially)  
Link with institutional knowledge management strategy  
Lack of institutional IPR policies  
Patchy subject coverage discourages use

**UHI Millennium Institute LOR**

Repository:

A range of types of resources in LO format

Repository dimensions:

Geographic - institutional  
Disciplinary – interdisciplinary

Educational sector – Higher Education

Community:

In pilot phase, hence no active user community yet; the LOR aims academic staff

Issues:

(Potentially) cultural misfit across disciplines

**Aberdeen University LOR**

Repository:

Not populated yet; aims to include a range of resources

Repository dimensions:

Geographic - institutional

Disciplinary – interdisciplinary

Educational sector – Higher Education

Community:

In pilot phase, hence no active user community yet; the LOR aims at learning technologists, IT training and documentation staff, lecturers, museum curators

Issues:

(Potentially) Cultural misfit across disciplines

User perceptions (particularly learning technologists) that LORs will hinder innovation

**University of Ireland Galway Institutional LOR**

Repository:

Not populated yet; aims to include a range of resources

Repository dimensions:

Geographic - institutional

Disciplinary – multidisciplinary

Educational sector – Higher Education

Community:

In pilot phase, hence no active user community yet; is targeted at university staff and academics

Issues:

(Potentially) Cultural misfit across disciplines

**National Digital Learning Repository (Ireland)**

Repository:

Includes a range of types of LOs

Repository dimensions:

Geographic - national

Disciplinary – multidisciplinary

Educational sector – Higher Education

Community:

In pilot phase, hence no active user community yet; is targeted at academics across Ireland

Issues:

(Potentially)

Managing multiple partners

**SIESWE Learning Exchange**

Repository:

Aims to include a range of types of LOs, including resources sourced from the internet

Repository dimensions:

Geographic - national

Disciplinary – social work

Educational sector – Higher Education, further education, postqualifying

Community:

No active user community yet; is targeted at Scottish social work educators and learners involved in social care education.

Issues:

Resistance to student use of LOR

Tension between drive to collaborate and sense of competition between institutions